HANDBOOK FOR

ARCHITECTS AND BUILDERS

PUBLISHED
UNDER THE AUSPICES
OF THE

Chicago Architects' Business Association

VOL. XIII, 1910

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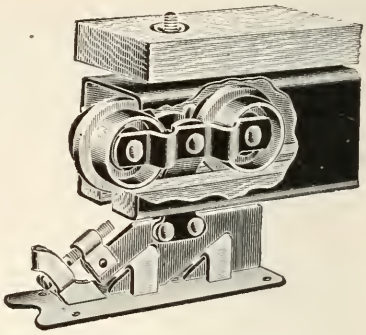
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EMERY STANFORD HALL, Editor

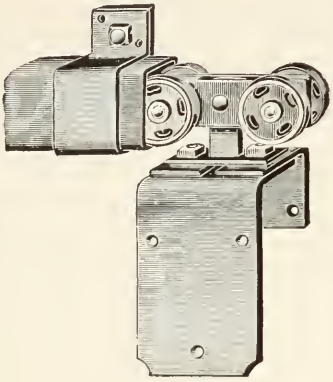
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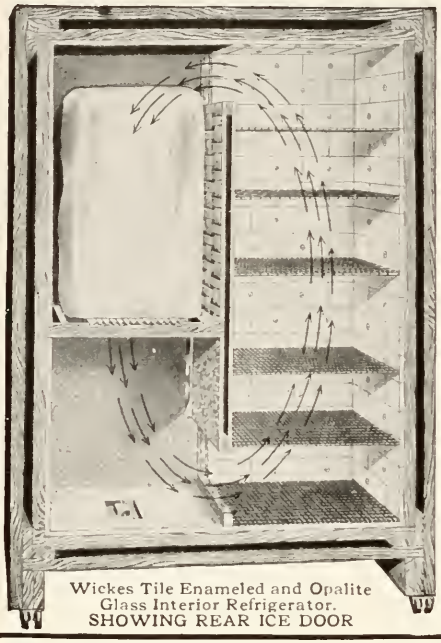
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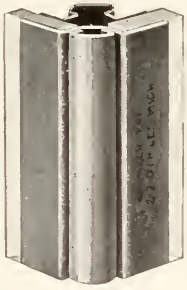
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Preface

The Thirteenth and luckiest number of the Handbook for Architects and Builders is before you. Its continuous use during these years eliminates the necessity of an introduction.

Users will find that the book is divided into departments of classified information and that the various departments are indexed separately in the back of the book. They will also find that there is a general index to departments and to the more important articles in previous issues, all of which can be located by consulting the table of contents on the back page of the book.

The topical division is as follows: Architectural Societies; Chicago Municipal Code pertaining to Building; Miscellaneous Contributed Articles and Advertisements including the rules of the various public service corporations, and Miscellaneous and Useful Information for Architects Concerning Building Engineering Trades and Materials. Matter composing the latter division is classified by topics as follows: Building Engineering Formulae, Tables of Weights; Quantities and Measures of Materials; Helps in Preparing Drawings and Specifications; Framed and Boxed Construction, including all work done under the Carpenters', Structural Iron Workers' and Ornamental Iron Workers' trades; Overlaying Construction, including all work done under the Sheet Metal Workers', Roofing Tile and Slate Layers' and Composition Roof Layers' trades; Sanitary, Illuminating and Electrical Power Equipment, including all work done under the Drainlayers', Sewer Builders', Plumbers', Gasfitters' and Electricians' trades; Heating, Ventilation and Steam-power, including all work done under the Steam Fitters', Machinists' and Ventilating Sheet-metal Workers' trades; Preservative and Decorative Coverings, including all work done under the Painters', Paper-hangers', Upholsterers' and Decorators' trades; Architectural Design and Indexes.

Mr. Homer R. Linn, M. Eng., continues as Editor of matters pertaining to Heating and Ventilation.

We print the Philadelphia Address of Mr. I. K. Pond; Mr. Fred J. Postel, Consulting Engineer, contributes an article on Wiring Specifications; Staunton P. Peck on Conveying Machinery in City Buildings; W. S. Potwin on Finishing of Woods. We also publish the rules recently adopted by the Architects and Contractors for Estimating Concrete and Excavation extras.

A reference work which meets the demand of architects and is used by them continuously, becomes a valuable advertising medium for those building contractors and material manufacturers and dealers who furnish material and labor for building purposes. Having caused the publication of this work, the Association became possessed of a commercially valuable commodity. This has been placed on the market for sale at its commercial value, and revenues thus obtained are used, first, to pay the expenses of publication, and second, to increase the Association's general expense fund.

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The Building Ordinances which the City Council of Chicago failed to pass at its last meeting, will be sent to users of the Handbook as a supplement when passed.

H. B. Whulock

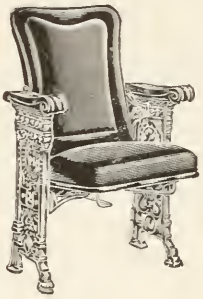
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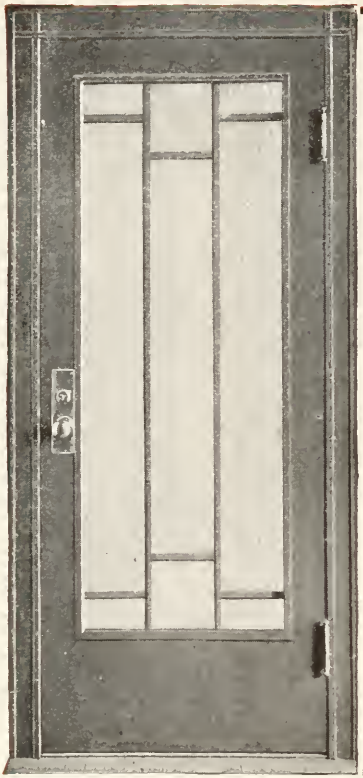
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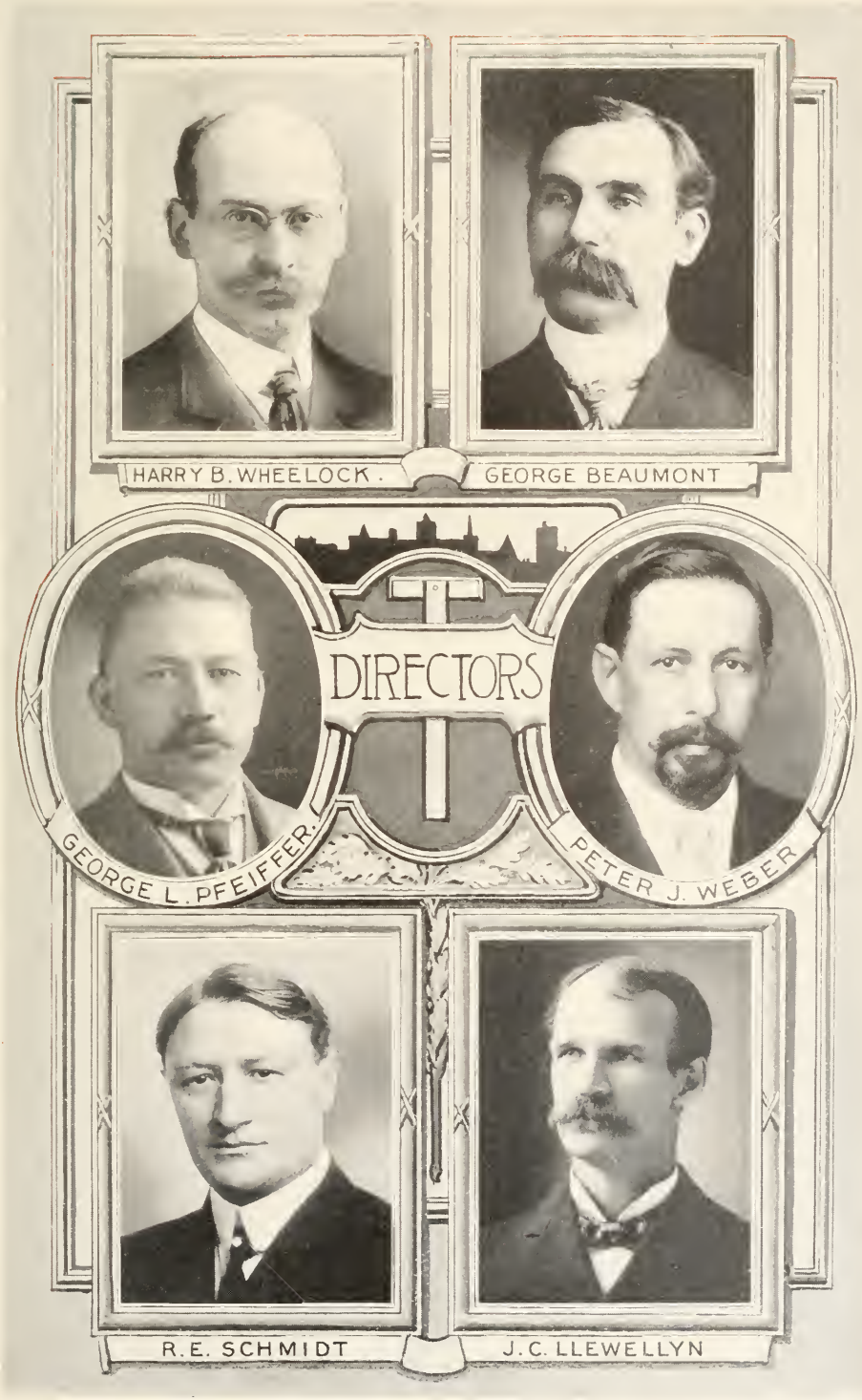
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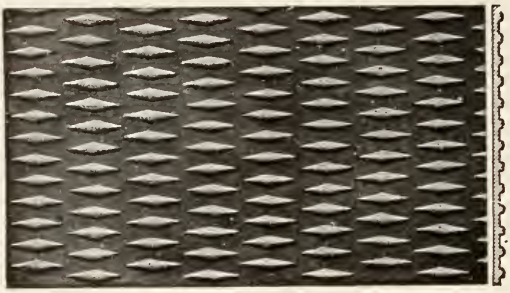
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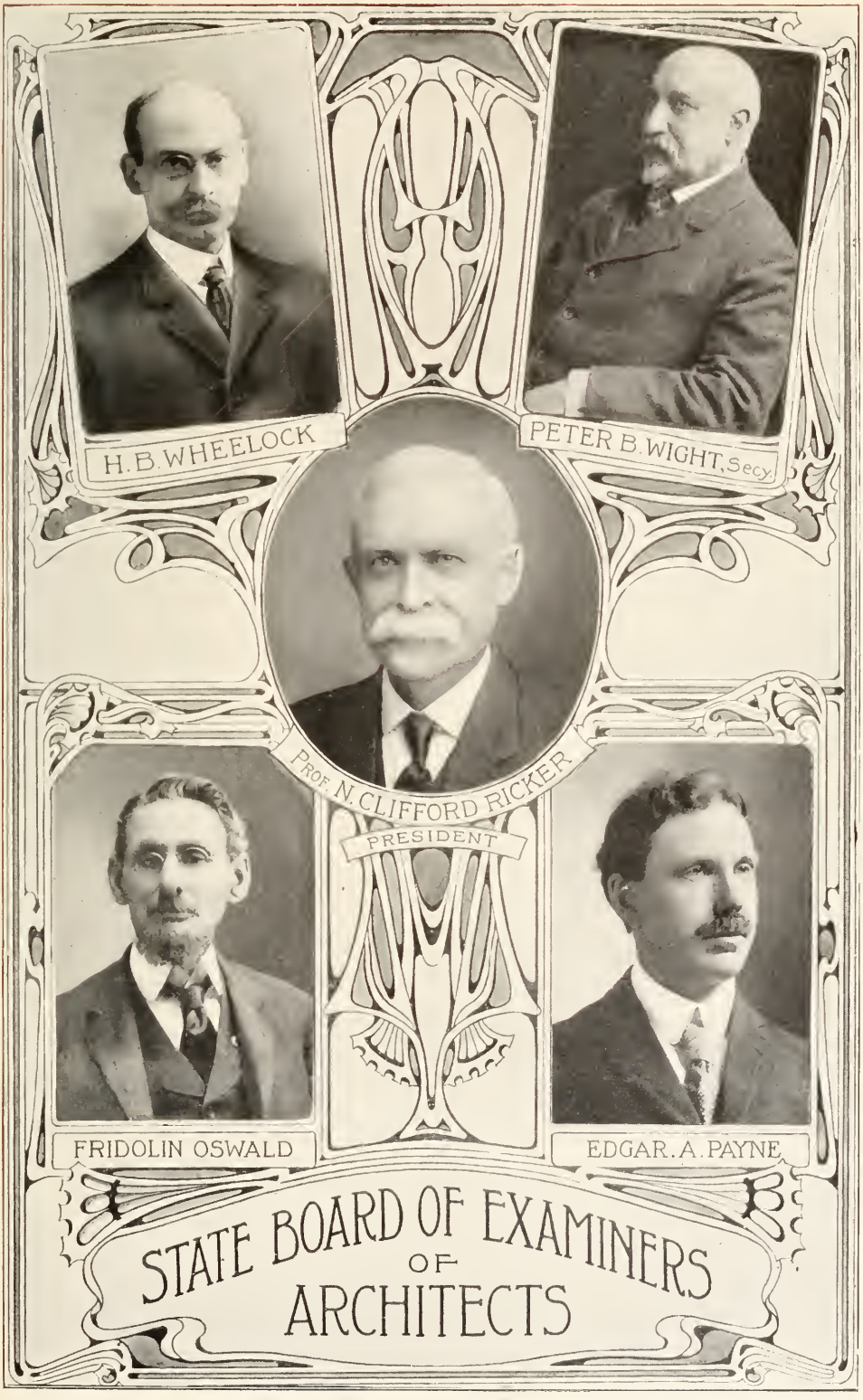
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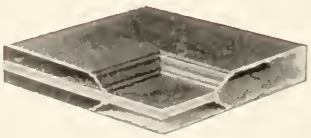
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Chicago Architects' Business Association

Organized January 12, 1897. Incorporated June 25, 1897

Editorial.

At a meeting of the Association early in the year, the time for holding the annual meeting was changed from the fourth Tuesday in October to the fourth Tuesday in June. This reduced the term of service of incumbents in office to eight months and curtailed their program of work.

It was for this reason that the Association elected to have the officers of '09-'10 succeed themselves, so that opportunity should be given to consummate the work begun. The president has appointed committees to succeed themselves, adding new names only where unavoidable vacancies occurred.

The membership roll has been increased by more than twenty new names. Death has removed three from the membership of the Association.

In the passing of Samuel A. Treat, the whole profession suffers a deep and heartfelt loss. The Chicago Architects' Business Association loses in him a staunch friend and member, an official of ability and enthusiasm, a colleague whose loyalty was worthy of emulation. He had twice been president of the C. A. B. A. and was for many years its treasurer. Mr. Treat was one of those men whose presence and influence have an elevating and ennobling effect upon mankind and who, in every age, contribute so much to the advancement and refinement of the race.

A consideration of the subjects under discussion at the meetings of the Association during the past year is beyond the province of this article, but it may be said that, while in most cases the subjects were scientific and withal intensely practical, the underlying thought was never lost sight of, namely: that the architect is not an architect unless he combine his materials in a way so as not to offend the eye; that his aim must always be to meet his practical requirements fully and at the same time give joy to the senses.

Effective and just judicial service can only come from a comprehensive knowledge of every viewpoint and every influencing circumstance. Such service must, of course, be free from entangling alliances and influences. Professional pride and integrity must predominate over interests of self. Even assuming the preponderance of professional influence, it is not good for the judge to place himself in a position where personal interests must or even appear to be sacrificed for the sake of just decisions. Judges are a part of the necessary present-day machinery of society. In matters of building the architect has been made the judge. It is apparent then that the architect should not enter into any contract with the owner, the contractor or assume any other interest by which his remuneration for service or his independent business profit shall be conditioned in anyway upon the time of rendering or the subject matter of his decisions. It is likewise of equal importance that he should have an accurate and comprehensive knowledge of the difficulties under which the work is executed and the projects financed. In other words, he must know the difficulties and interests of both the owner and the contractor.

The Chicago Architects' Business Association has accomplished much during the past year through its committees in making clearer to architects the conditions under which the contractor labors. Its Committee on Public Action has been the instrument for arranging a series of monthly noon-day conferences between the various contracting interests and the architects; its Committee on Uniform Rules for Measurement of Concrete and Excavation has, in collaboration with committees from the various other Associations identified with building, succeeded in formulating a series of rules for said measurement. And now a committee of the Association is engaged in drafting a uniform agreement and general conditions to specifications which promise to be most valuable in defining the conditions and rules under which the owner and the contractor should work and the position which the architect should occupy. The Committee on Public Action has also given much assistance to public officers and commissions in the promulgation and revision of laws and in the prosecution of offenders against same. While these conferences accomplish much good in the solution of special problems, probably even greater good has been accomplished through these prolonged discussions resulting in bringing about a better understanding on the part of the architect of the conditions and difficulties under which the contractor works and, on the part of the contractor, of the conditions and limitations under which the architect works

We feel, on the whole, that the Chicago Architects' Business Association is to be congratulated on its achievements during the year just completed.

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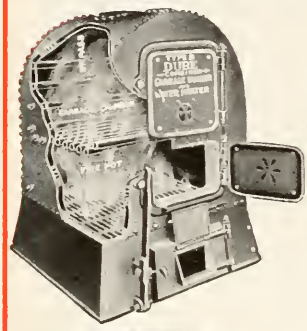
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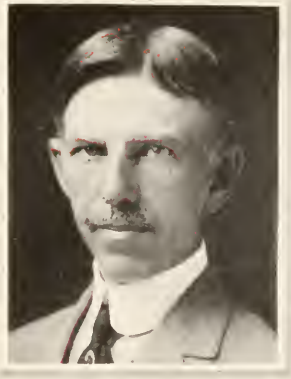
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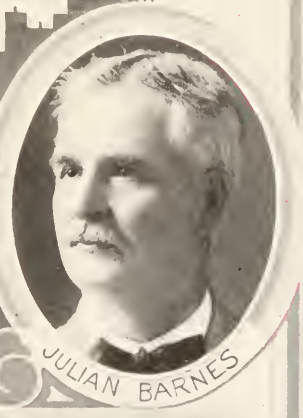


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THE CHICAGO ARCHITECTS' BUSINESS ASSOCIATION CANONS OF PROFESSIONAL ETHICS

Preamble.

The architect is engaged in a profession which carries with it grave responsibilities to the public. These duties and responsibilities cannot be met unless the motives, conduct and ability of the members of the profession are such as to command respect and confidence.

The profession of architecture calls for men of the highest integrity, and executive and artistic ability.

The architect is entrusted with financial undertakings where his honesty of purpose must be above suspicion; he acts as professional adviser to his client, and his advice must be absolutely disinterested: he is charged with the exercise of judicial functions as between client and contractor, and must act with entire impartiality, and he has moral responsibilities toward his professional associates and subordnates.

The people of the State of Illinois have a right to expect a high standard of practice and conduct on the part of the architects whom they have licensed to practice. Because an architect is a quasi public official it is imperative that he assume no obligations which shall place official duty and self-interest in conflict.

The Canons of Ethics.

No set of rules can be framed which particularize all the duties of the architect in his various relations to the public, to his client, to the building trades and to his professional brethren.

The following canons of ethics cover certain broad principles which should govern the conduct of members of the profession and should serve as a guide in circumstances other than those enumerated:

I.—On Certain Duties to the Public.

The architect's more important work is of a character so permanent and enduring that he owes it to the public to use his best efforts to make it such as may raise the standard of taste in the community and be in itself a public ornament. He should design with due regard to surroundings and should endeavor to check any individualism, whether in himself or his client, that is opposed to the public good. He should take part in those movements for public betterment in which his training and experience enable him to give useful service. He should insist on safe and sanitary construction and he should at all times hold the safe guarding of human life and health as of paramount importance to the interests of client, contractor or self.

II.—On the Architect's Status.

The architect's relation to his client is primarily that of professional advisor. This relation maintains throughout the entire period of his service. When, however, a contract is executed between his client and a builder or other person by the terms of which the architect becomes the official interpreter of its conditions and the judge of its performance, a new relation is created. In respect to the matters under contract, it is incumbent upon the architect to side neither with the client nor contractor, but to endeavor, in so far as his action may determine, that the contract be faithfully carried out according to its true spirit and intent.

It is not proper for the architect to assume to act as the owner's agent unless he has been specifically empowered so to act: by so doing he becomes a party to the contract and in a sense disqualified in his judicial capacity.

The fact that the architect's payment comes through the client does not invalidate his professional obligation to act with impartiality to both parties to the contract. It is essential, however, in order to eliminate the influence of self-interest, that the architect shall not enter into any contract with the client which shall condition his payment upon his decisions or advice.

III.—On Preliminary Drawings and Estimates.

The architect should impress upon his client at the outset the importance of sufficient time for the study and preparation of drawings and specifications. If, on the basis of approved preliminary

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sketches, the approximate cost of the work has been mutually considered, the architect should endeavor to bring his working drawings to meet such approximate cost, provided that his client has requested no departure from the original basis of estimate. But at the same time he should acquaint his client with the conditional character of preliminary estimates. Complete and final figures can be had only from complete and final drawings and specifications. If an unconditional limit of cost is imposed before such drawings are made and estimated, the architect must be free to make such adjustments as seem necessary to that end.

IV.—On Superintendence and Expert Service.

On all work except the simplest, it is to the interest of the client to employ an inspector or clerk-of-the-works; in many engineering problems and in certain esthetic problems such as sculpture, decorative painting, gardening and the like, it is to the interest of the client to have specialized expert service. The architect should so inform the client and assist him in obtaining such service. In order to secure unified and harmonious working organization, only such persons should be selected by the owner for consulting experts as shall work in harmony with the architect and shall be approved by him.

V.—On the Architect's Charges.

The schedule of charges of the Chicago Architect's Business Association is recognized as a proper minimum of payment, but where no other architect is affected it is allowable for an architect to make such an arrangement with his client as is mutually satisfactory. He may not reduce his fee below the schedule of charges in an attempt to supplant another architect; it is reasonable and proper to charge higher rates than those of the schedule when his special skill and the quality of his service justify the increase.

A system of compensation based on the actual cost to the architect on a given piece of work plus an agreed professional fee, has much to commend it.

VI.—On Needless Expenditure.

The architect should scrupulously guard cost, and refrain from introducing needless expense or any extravagance in material or construction that may add to cost of building, without compensating gain to the client.

VII.—On Payments for Expert Service.

When retained as an expert, whether in connection with competitions or otherwise, the architect should receive a compensation proportionate to the responsibility and difficulty of the service. No duty of the architect is more exacting than such service, and the honor of the profession is involved in it. Under no circumstances should experts, knowingly, name prices in competition with each other for a given employment. Where governmental regulations prohibit adequate compensation for expert service, it is better to render such service without emolument than to accept a payment out of proportion to the importance of the service rendered.

VIII.—On the Selection of Bidders or Contractors.

The architect should advise his client in the selection of bidders and in the award of contract.

In selecting none but worthy bidders and in advising the award only to contractors who are honest and competent, the architect protects the interests of his client and helps to raise the ethical standard in building.

IX.—On Duties to the Contractor.

On the signing of a contract between owner and builder, the architect is placed in a judicial position and is bound to act with absolute fairness; he is also judge in his own right, deciding whether or not the intent of his plans or specifications is properly carried out, and exercising his judgment as to the true meaning thereof. He should, therefore, take special care to see that these drawings and specifications are complete and accurate, and he should never call upon the contractor to make good his own oversights or errors, or attempt to shirk responsibility by "blanket" clauses.

X.—On Engaging in the Building Trades.

The architect should not engage in any of the building trades, nor should he form any trade partnership or agreement with any person or firm connected therewith;



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nor should he have any financial interests in any building material or device of such a nature as to render his professional action liable to a suspicion of self-interest: if he have any interest in building material or device, he should not specify or use the same without the full knowledge and approval of his client.

XI.—On Accepting Commission or Favors.

The architect may not receive any commission or any substantial service or favor from a dealer, a contractor, or from any interested person other than his client.

XII.—On Encouraging Good Workmanship.

In his authority to interpret and enforce the provisions of the contract, the architect is vested with large powers which he should use with unbiased judgment. While he must condemn bad work, he should also make a point of commending that which is good.

Intelligent initiative, artistic or mechanical, on the part of craftsmen and workmen, should be promptly recognized and encouraged, and the architect should make evident his appreciation of the dignity and importance of their work.

XIII.—On Offering Service Gratuitously.

The offering of professional service on approval, unless warranted by personal or previous business relations, tends to lower the dignity and standing of the profession: also to provide motive for dishonest representation and is to be condemned.

XIV.—On Advertising.

Advertising in any form is to be discouraged as tending to lower the standing of the profession. The presentation of ordinary business cards is a matter of individual taste and not per se improper; but the solicitation of work by circulars or advertisements and the inspiring or inserting of self-laudatory notice in the press are unprofessional.

The best recommendation of an architect is a well-merited reputation for professional capacity and fidelity to trust.

XV.—On Signing Buildings and Use of Titles.

The signing of buildings has the indorsement of the Chicago Architect's Business Association. The use of the initials designating degrees or technical society membership is proper in connection with any professional service and is encouraged as helping to make known the nature of the honor they imply.

XVI.—On Competitions.

In no way does the architect come more conspicuously before the public than through competitions. It is especially desirable that in such circumstances he should conduct himself with self-respect and dignity. To under value and cheapen his service or to compete where a just award is not safe guarded is inconsistent with this position. Competitions are undesirable from the standpoint of both the client and the architect and a member of of the Association should discourage the holding of same. If a competition becomes inevitible, because of governmental regulations, he should not enter either as a competitor or a professional advisor unless the competition is to be conducted according to the best practice and usage of the profession as formulated from time to time by the American Institute of Architects. Except as an authorized competitor he may not attempt to secure work for which competition has been instituted.

He may not present drawings to secure work for which competition has been closed but not decided.

He may not attempt to influence the award in any competition.

XVII.—On the Expert's Future Status.

An architect may not undertake a further commission on any building or work after having acted in an expert capacity in formulating a program which later is put into effect, or after having acted in an advisory capacity in the matter of awards in competition. Having acted in either or both of such capacities should bar an architect from eligibility to execute commissions upon the work in question.

XVIII.—On Criticising the Work of Others.

An architect may not criticise publicly in the press the work of a fellow architect except over his own signature, or editorially; and he may not intentionally injure, directly or indirectly, the reputation, prospects or business of a fellow architect.

XIX.—On Undertaking the Work of Another.

An architect may not undertake a commission while the just claim of a fellow architect, who had previously undertaken it, remains unsatisfied; nor may he attempt to supplant a fellow architect or to obtain a commission after steps have been taken toward the appointment of another architect.

XX.—On Duties Toward the Student Draughtsman.

It is the duty of the architect to advise and assist those who intend making architecture their career. The intending student should be urged to secure a preparation of broad general culture equivalent to that required for the degree of A. B., concurrently with or followed by a thorough course in a well organized school of architecture.

In cases where such preparation is out of the question and the beginner must get his training in the office of an architect, the latter should assist him to the best of

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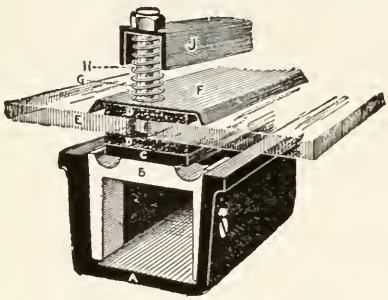
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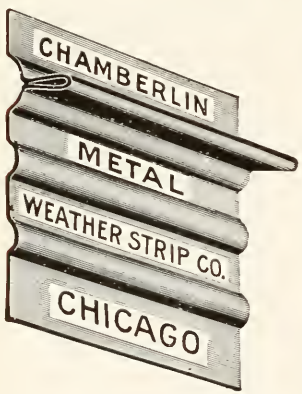
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his ability by instruction and advice. An architect, should, as far as possible, urge his draughtsmen to avail themselves of educational opportunities. To this end he should give encouragement to all worthy schemes and institutions for architectural education.

Members of the association cannot too strongly insist that a thorough technical preparation for the practice of architecture should rest upon a foundation of general culture.

XXI.—On Duties Toward Building Authorities.

The architect should support all federal, state and municipal officials who have charge of matters relating to building and endeavor to maintain or improve the standards of their departments. His quasi public official capacity requires him to show respect for law by careful and conscientious compliance with all building regulations, and if any such appear to him unwise or unfair, he should endeavor to have such regulations altered, but until so altered he should comply with them. An architect because of his official relation to the state and of his moral obligation should not even under his client's instructions encourage any practices contrary to law or hostile to public interests; for he is not obliged to accept a given piece of work, hence he cannot urge in extenuation and to escape the condemnation attaching to his acts that he has but followed his client's instructions.

XXII.—On Professional Qualifications.

The assumption of the title of architect should be held to mean that the bearer has the professional knowledge, both theoretical and practical, and the natural ability needed for the proper invention, illustration and supervision of all building operations which he may undertake.

XXIII.—On Matters Adjudged Unprofessional.

The following code, based on a report of a special committee of the American Institute of Architects, is adopted by the Chicago Architects' Business Association as a general guide, yet the enumeration of particular duties should not be construed as the denial of the existence of others equally imperative though not specifically mentioned. It should also be noted that these sections indicate offenses of greatly varying degrees of gravity:

It is unprofessional for an architect—

1. To engage in any of the building trades or to form any trade partnership or agreement with any person or firm engaged therein.

2. To guarantee an estimate or contract by bond or otherwise.

3. To accept a commission or any substantial service or favor from a contractor, or anyone connected with the building trades.

4. To advertise in any form.

5. To enter any competition the terms of which are not in harmony with principles approved by the American Institute, especially if such terms have been specifically condemned by the American Institute or a local chapter thereof.

6. To attempt in any way except as a duly authorized competitor to secure work for which a competition has been instituted.

7. To attempt to influence the award of a competition.

8. To injure intentionally the fair reputation, prospects or business of another architect.

9. To criticise anonymously in the public prints, except editorially, the professional conduct or work of a fellow architect.

10. To undertake a commission while the just claim of another architect who has previously undertaken it remains unsatisfied.

11. To attempt to supplant a fellow architect after definite steps have been taken toward his employment.

12. To offer or perform services at rates lower than those approved as minimum by the Chicago Architects' Business Association in an attempt to supplant or underbid another architect.

13. To act in a manner detrimental to the best interests of the profession.

SCHEDULE OF PROPER MINIMUM CHARGES AND PROFESSIONAL PRACTICE OF ARCHITECTS RECOMMENDED BY THE CHICAGO ARCHITECTS' BUSINESS ASSOCIATION

1. The architect's professional services consist of the necessary conferences, the preparation of preliminary studies, working drawings, specifications, large scale and full size detail drawings, and of the general direction and supervision of the work, for which, except as hereinafter mentioned, the minimum charge, based upon the total cost of the work complete, is six per cent. **Total cost** is to be interpreted as the cost of all materials and labor necessary to complete the work, plus contractors' profits and expenses, as such cost would be if all materials were new and all labor fully paid, at market prices current when the work was ordered.

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2. On residential work, on alterations to existing buildings, on monuments, furniture, decorative and cabinet work, and landscape architecture, it is proper to make a higher charge than above indicated.

3. The architect is entitled to compensation for articles purchased under his direction, even though not designed by him.

4. If an operation is conducted under separate contracts, rather than under a general contract, it is proper to charge a special fee in addition to the charges mentioned elsewhere in this schedule.

5. Where the architect is not otherwise retained, consultation fees for professional advice are to be paid in proportion to the importance of the questions involved and services rendered.

6. Where heating, ventilating, mechanical, structural, electrical and sanitary problems are of such a nature as to require the services of a specialist, the owner is to pay for such services in addition to the architect's regular commission. Chemical and mechanical tests and surveys, when required, are to be paid for by the owner.

7. Necessary traveling expenses are to be paid by the owner.

8. If, after a definite scheme has been approved, changes in drawings, specifications or other documents are required by the owner; or if the architect be put to extra labor or expense by the delinquency or insolvency of a contractor, the architect shall be paid for such additional services and expense.

9. The architect's entire fee is itemized and proportionate payments on account are due the architect, as the following items are completed:

Preliminary Studies	.2
General drawings	.2
Specifications	.1
Scale and full size details	.2
General Supervision of the work	.3

10. Items of service are comprehended as follows:

(a) **Preliminary Studies** consist of the necessary conferences, inspections, studies and sketches modified and remodified to determine the client's problem and illustrate a satisfactory general solution of same, both as to plan and elevation. Illustrative sketches for this purpose need not be to accurate scale, but should be approximately correct as to general dimensions and proportion.

(b) **General Drawings** include figured scale plans of the various stories, elevations of all the fronts, such general vertical sections as may be necessary to elucidate the design, and such details, drawn to still larger scale as, with the assistance of printed notes, and of the accompanying specifications, may make the whole scheme clearly evident to the mind of the competent builder and give him a full and complete comprehension of all the structure conditions as they affect the vital questions of quality and quantity of materials, of character of workmanship, and of cost.

(c) **Specifications** consist of a supplementary statement in words, of at least all those items of information regarding a proposed building which are not set forth in the drawings.

(d) **Detail Drawings** include all the necessary supplementary drawings required for the use of the builders, to enable them to so provide and shape their material that it may be adjusted to its proper place or function in the building with the least delay, and the smallest chance for errors and misfits. If not prepared until after the contract for the building is let they must not impose on the contractor any labor or material which is not called for by the spirit and intent of the "General Drawings" and "Specifications."

(e) The **Supervision** of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk-of-the-works or inspector of construction) means such inspection by the architect or his deputy, of work in studios and shops or a building or other work in process of erection, completion or alteration, as he finds necessary to ascertain whether it is being executed in general conformity with his drawings and specifications or directions. He has authority to reject any part of the work which does not so conform and to order its removal and reconstruction. He has authority to act in emergencies that may arise in the course of construction, to order necessary changes, and to define the intent and meaning of the drawings and specifications. On operations where a clerk-of-the-works or inspector of construction is required, the architect shall employ such assistance at the owner's expense.

11. Drawings and specifications, as instruments of service, are the property of the architect.

12. Exceptions.

Dwellings costing less than $10,000	10%
Lofts not requiring special planning for machinery or arrangement	5%
Additions and alterations to dwellings	12%
Additions and alterations to business buildings	10%

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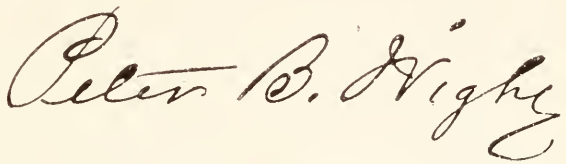
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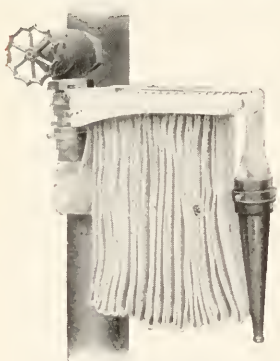
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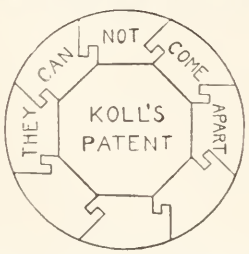
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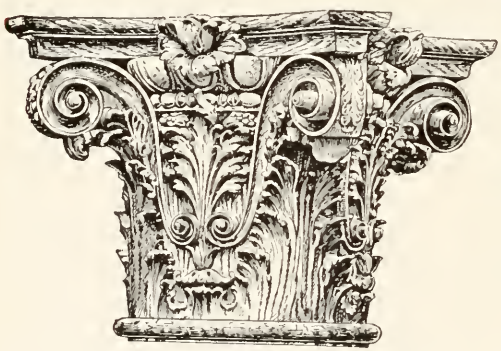
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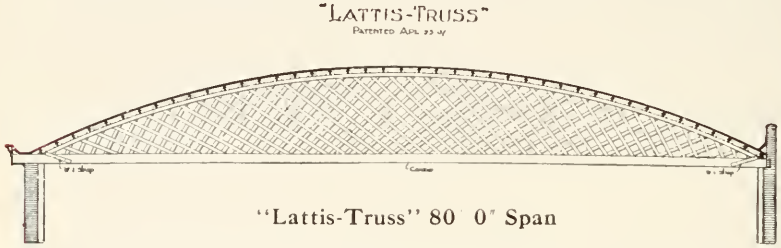
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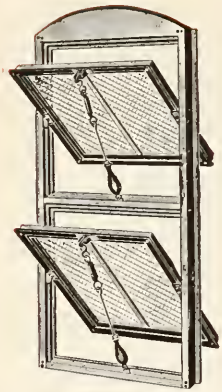
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Dunham, Geo. Foote, Portland, Ore.
Edbrooke, H. W. J., Tabor Opera House B., Denver.
Gilbert, I. H., Colorado Springs, Colo.
Harbeck, J. R., 123 Theodore St., Detroit.
Heinz, G. P., 522 Colorado Bldg., Denver.
Hoeppner, E. A., 1325 Merchants' Ex. Bldg., San Francisco.
Hoffman, E. G., Portland, Ore.
Houpert, Pierre, Seattle, Wash.
Jogerst, J. P., 605 Kasota Blk., Minneapolis.
Kalter, W. I., Portland, Ore.
Long, Birch B., 82 W. 12th St., New York.
Mattison, V. A., La Salle, Ill.
Morse, B. E., Twin Falls, Idaho.
Oliver, R. H., Evansville, Ind.
Phillips, John H., care Reed & Stem, 73 E. 42d St., New York.
Potts, J. Oliver, 1317 Market St., Philadelphia.
Purcell, Wm. G., N. Y. Life Bldg., Minneapolis.
Torrance, James R., 186 Claremont Ave., New York City.
Tuttle, A. B., 11 Rue Scribe, Paris, France.
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White, Melville P., Canada Foundry Co., Ltd., Toronto, Ont.
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Lawrie, Henry, Caxton Bldg., Omaha, Neb.
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McLean, Robert C., Minneapolis, Minn.
Phimister, D. G., 539 Flournoy St.
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Wagner, Fritz, 1415 Railway Exc. Bldg.



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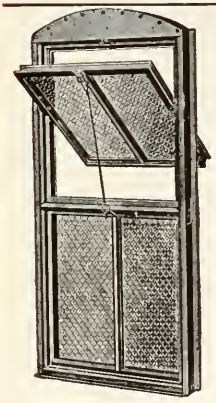
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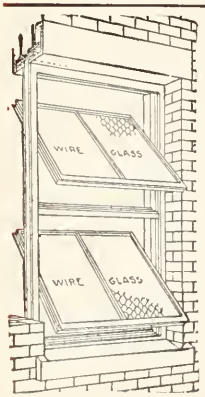
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	Members.	Address.	Date of Election.
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F. A. I. A.	Benan, S. S.	237 Michigan Ave.	1890
F. A. I. A.	Berlin, Robert C.	153 La Salle St.	1890
F. A. I. A.	Burnham, D. H.	Railway Exchange	1894
A. A. I. A.	Carpenter, Frank A.	Rockford, Ill.	1907
F. A. I. A.	Clay, W. W.	218 La Salle St	1891
F. A. I. A.	Coolidge, Chas. A.	1614-206 LaSalle St.	1896
A. A. I. A.	Crowen, Samuel N.	Stock Exchange Bldg.	1907
A. A. I. A.	Dinkelberg, F. P.	135 Adams St.	1907
A. A. I. A.	Egan, James J.	17 Van Buren St.	1908
A. A. I. A.	Fellows, Wm. K.	150 Michigan Ave.	1896
F. A. I. A.	Flanders, J. J.	76 Dearborn St.	1890
A. A. I. A.	Fletcher, Robert C.	172 Washington St.	1901
F. A. I. A.	Frost, Chas. S.	Borland Bldg.	1891
A. A. I. A.	Granger, Alfred Hoyt	Borland Bldg.	1907
F. A. I. A.	Hallberg, L. G.	808-84 La Salle St.	1890
A. A. I. A.	Hamilton, John L.	140 Dearborn St.	1906
F. A. I. A.	Hill, Henry W.	70 La Salle St.	1890
F. A. I. A.	Holabird, William	1618 Monadnock Blk.	1890
A. A. I. A.	Jensen, Elmer C.	1101 New York Life Bldg.	1908
A. A. I. A.	Llewellyn, Jos. C.	First National Bank	1908
A. A. I. A.	Maher, George W.	218 La Salle St.	1907
A. A. I. A.	Marshall, Benj. H.	First National Bank Bldg.	1907
F. A. I. A.	Mundie, W. B.	171 La Salle St.	1893
A. A. I. A.	Nimmons, George C.	150 Michigan Ave.	1903
F. A. I. A.	Otis, Wm. A.	175 Dearborn St.	1890
F. A. I. A.	Patton, N. S.	153 La Salle St.	1892
A. A. I. A.	Perkins, Dwight Heald	Hartford Bldg.	1894
F. A. I. A.	Perkins, Frederick W.	46 Van Buren St.	1891
A. A. I. A.	Pond, A. B.	1109 Steinway Hall	1902
F. A. I. A.	Pond, I. K.	1109 Steinway Hall	1902
A. A. I. A.	Powers, Horace S.	1200 Steinway Hall	1906
A. A. I. A.	Prindeville, Chas. H.	17 Van Buren St.	1908
F. A. I. A.	Quackenbos, L. G.	103 Fifth Ave	1890
F. A. I. A.	Ricker, N. Clifford	Urbana, Ill.	1907
F. A. I. A.	Roche, M.	1618 Monadnock Blk.	1890
F. A. I. A.	Schmidt, Richard E.	172 Washington St.	1905
F. A. I. A.	Shaw, Howard Van Doren	172-161 State St.	1903
A. A. I. A.	Shepardson, Ralph S.	Coulter Blk., Aurora, Ill.	1907
A. A. I. A.	Spencer, Robert C.	1200 Steinway Hall	1906
A. A. I. A.	Stanhope, Leon E.	184 La Salle St.	1904
A. A. I. A.	Tomlinson, Henry W.	809 Steinway Hall	1908
A. A. I. A.	Vail, Morrison H.	Dixon, Ill.	1905
A. A. I. A.	Waterbury, Chas. D.	1109 Steinway Hall	1909
A. A. I. A.	Waterman, H. H.	218 La Salle St.	1901
A. A. I. A.	Weber, P. J.	Fisher Bldg.	1904
A. A. I. A.	Wheelock, H. B.	Schiller Bldg.	1894
A. A. I. A.	White, Chas. E. Jr.	Oak Park, Ills.	1907
F. A. I. A.	Wight, Peter B.	1112 Chamber of Commerce Bldg.	1893
A. A. I. A.	Worst, F. W.	Aurora, Ill.	1907
A. A. I. A.	Woltersdorf, A. F.	70 La Salle St.	1902
F. A. I. A.	Zimmerman, W. Carbys	1101 Steinway Hall	1894

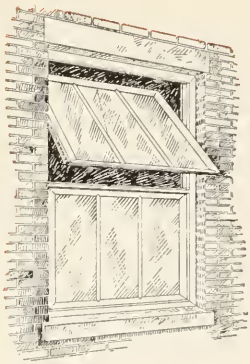
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Members.	Address.	Date of Election.
Baumann, Fred.	43 Pine Grove Ave.	1900
Matz, Otto	78 La Salle St.	1902
Whitehouse, F. M.	1 Madison Ave., New York	1907

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Members.	Address.	Date of Election.
Barnes, Julian	153 La Salle St.	1908
Brinkman, Wm. J.	17 Van Buren St.	1908
Brush, C. E.	99 Randolph St.	1898
Chatten, Melville C.	1111 Steinway Hall	1909
Clark, William Jerome	206 La Salle St.	1906
Colcord, Albert E.	611-110 Dearborn St.	1896
Dean, Geo. R.	218 La Salle St.	1910
Dunderdale, George, care Colonial	Hotel, Sacramento, Cal.	1905
Fox, Chas. J.	First National Bank Bldg.	1909
Gillette, Edwin F.	140 Dearborn St.	1910
Graham, Ernest R.	Railway Exchange	1904
Griffin, Walter B.,	1200 Steinway Hall	1909
Hall, Emery Stanford.	153 La Salle St.	1908
Hammond, Chas. H.,	1111 Steinway Hall	1909
Heun, Arthur	810 Steinway Hall	1909
Holden, Ben Edwin	1800 Railway Exchange	1905
Holmes, Morris G.	140 Dearborn St.	1905
Hoskins, John M.,	1280 W. Madison St.	1891
Huehl, H. W.	59 Metropolitan Blk.	1898
Lowe, Elmo C.	206 La Salle St.	1909
Matteson, Andre Victor.	La Salle, Ill.	1906
Morehouse, M. J.	702 Fisher Bldg.	1902
Oswald, Fridolin	Alhambra, Ill.	1907

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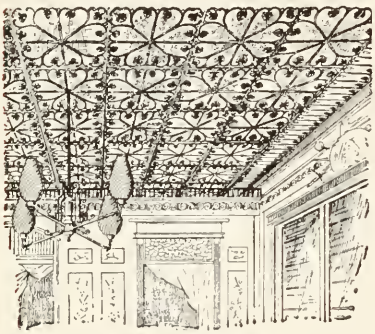
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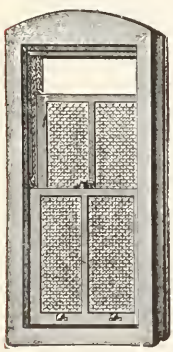
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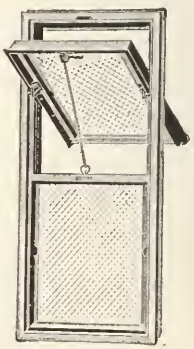


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Rogers, John Arthur	1615 Ashland Blk	
Schlacks, H. L.	19 Borden Blk.	1908
Schmid, Richard G.	59 Metropolitan Blk.	1898
Shattuck, Walter F.	153 La Salle St.	1909
Smith, Wm. Jones	1618 Monadnock Blk.	1909
Tallmadge, Thos. E.	1004 Security Bldg.	1910
Von Holst, Hermann V.	907 Steinway Hall	1909
Winslow, Benjamin E.,	1618 Monadnock Blk.	1908

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Up to date of going to press. Subject to changes.

FRED A. BUSSE	Mayor.
VERNON L. BEAN	Secretary to Mayor.
EDW. WELTMAN	Assistant Secretary, Mayor's Office.
CHAS. W. ANDREWS	Oil Inspector.
JOHN KJELLANDER	City Sealer.
WALTER H. WILSON	City Comptroller.
LOUIS E. GOSSELIN	Deputy City Comptroller.
B. J. MULLANEY	Commissioner of Public Works.
ISAAC N. POWELL	City Treasurer.
FRANCIS D. CONNERY	City Clerk.
EDWARD J. PADDEN	Chief Clerk, City Clerk's Office.
WILLIAM CARROLL	City Electrician.
WALTER J. RAYMER	Track Elevation Expert.
ERNEST J. MAGERSTADT	City Collector.
J. F. McCARTY	Deputy City Collector.
WM. A. EVANS	Health Department.
W. A. COLEMAN	Department of Supplies.
ROBT. M. COCHRAN	Superintendent of Streets.
ELTON LOWER, HIRAM D. FARGO, M. L. McKINLEY	Civil Service Commission.
PERCY B. COFFIN	Secretary of Civil Service Commission.
MURDOCH CAMPBELL	Building Commissioner.
LE ROY T. STEWARD	Chief of Police.
HERMAN F. SCHUETTLER	Assistant Chief of Police.
EDWARD J. BRUNDAGE	Corporation Counsel.
JOHN R. CAVERLY	City Attorney.
GEO. H. WHITE	City Prosecutor.
JOHN D. REILLY	Map Department.
FRANCIS A. EASTMAN	City Statistician.
PATRICK WHITE	Superintendent of Bridges.
L. BLAKE BALDWIN	City Physician.
WM. J. McCOURT	Superintendent Bureau of Water.
STEPHEN B. WOOD	Detective Department.
JOHN J. HOULIHAN	Inspector of Steam Boilers and Steam Plants.
PAUL P. BIRD	Smoke Inspector.
WM. B. BURKE	Gas Inspector.
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A. J. MURRAY	Superintendent of Sidewalks.
CHAS. B. BALL	Chief of Sanitary Department.
EDWARD PRITCHARD	Secretary Health Department.
SIMON MAYER	Secretary of Police.
JOHN ERICSON	City Engineer.
ALBERT F. KEENEY (President), VINCENT J. JOZWIAKOWSKI, JOHN BURNS, JOHN MINWEGEN, FELIX NORDEN	Board of Local Improvements.
CHAS. V. STANDISH	Secretary Board Local Improvements.
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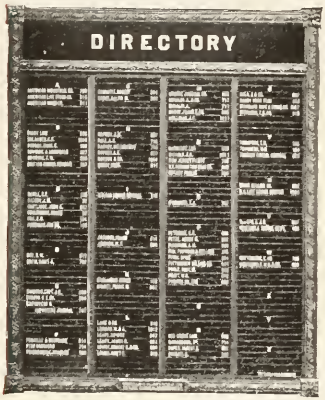
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BYRON BOYDEN, Counsel.....107 Dearborn Street
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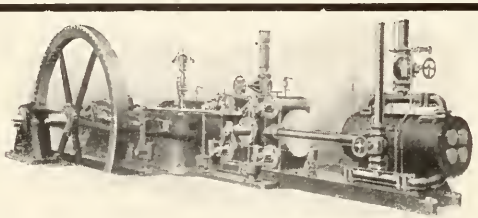
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TO THE

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BUILDING ORDINANCE

OF THE

ITY OF CHICAGO

Passed December 19, 1910
In Effect January 9, 1911

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BUILDING ORDINANCE

OF

THE CITY OF CHICAGO

Passed by the City Council Dec. 5th, 1910.

Comprising Sections 199 to 722 inclusive.

Effective January 9, 1911.

AN ORDINANCE.

Relating to buildings within the City of Chicago.

Be it ordained by the City Council of the City of Chicago:

Section 1. That there is hereby added to the Revised Municipal Code of Chicago of 1905 a new Chapter, to be known as Chapter XV, which shall read as follows:

CHAPTER XV.

ARTICLE 1.

Buildings.

199. **Department of Buildings Established—Officers).** There is hereby established an executive department of the municipal government of the City of Chicago which shall be known as the Department of Buildings, and which shall embrace a Commissioner of Buildings, an Engineer in Charge, a Building Inspector in Charge, an Elevator Inspector in Charge, a Fire Escape Inspector in Charge, a Secretary to the Commissioner of Buildings and such other assistants and employes as the City Council may by ordinance provide.

200. **Building Commissioner—Office Created—Appointment—Bond.)** (a) There is hereby created the office of Commissioner of Buildings. He shall be the head of said Department of Buildings, and shall be an experienced architect, or a civil, structural or architectural engineer or a building contractor or an efficient building mechanic and shall have engaged as an architect or a civil, structural or architectural engineer or building contractor or building mechanic for a period of not less than ten years prior to his appointment; and during his term of office as Commissioner of Buildings he shall not be engaged in any other business.

(b) He shall be appointed by the Mayor, by and with the advice and consent of the City Council.

(c) The Commissioner of Buildings before entering upon the duties of his office shall execute a bond to the City in the sum of twenty-five thousand dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of his duties as the Commissioner of Buildings.

200½. **Powers—Appointment of Subordinates—Duties of Commissioner.)** (a) He shall have the management and control of all matters and things pertaining to the department of buildings, and shall appoint, and may remove according to law, all subordinate officers and assistants in his department. All subordinate officers, assistants, clerks and employes in said department shall be subject to such rules and regulations as shall be prescribed from time to time by said commissioner.

(b) The Commissioner of Buildings shall institute such measures and prescribe such rules and regulations for the control and guidance of his subordinate officers and employes as shall secure the careful inspection of all buildings which in process of construction, alteration, repair or removal and the strict enforcement of the several provisions of this chapter.

(c) It shall be the duty of said commissioner and his assistants to enforce all ordinances relating to the erection, construction, alteration, repair, removal or the safety of buildings.

201. **Inspection of all Buildings in General Use—Precautions in Behalf of Public Safety—May Require Repair or Alteration in Such Cases—Interpretation of this Chapter.** (a) The Commissioner of Buildings shall inspect or cause to be inspected all public school buildings, public halls, churches, theaters, buildings used either for manufacturing or commercial purposes, hotels, apartment houses and other buildings or structures occupied or frequented by large numbers of people, for the purpose of determining the safety of such buildings, or any parts or appliances or equipment thereof; the sufficiency of their doors, passageways, aisles, stairways, corridors, exits or fire escapes and generally their facilities for egress in case of fire or other accidents, and the strength of their floors, and he shall make return of all violations of the several provisions of this chapter to the Law Department for prosecution.

(b) It shall be the duty of the Commissioner of Buildings, when any citizen represents that combustible materials are kept in any place in the city in an insecure manner, or that the doors, stairways, corridors, exits or fire escapes in any factory or workshop or other place of employment are insufficient for the escape of employes in case of fire, panic or accident, or do not comply with the provisions of this Chapter; or that the funnels, flues, fire boxes, or heating apparatus in any building in the city are insecure or dangerous, or that any part of any building in the city is in an unsafe or dangerous condition or in any wise in contravention of this Chapter, to make an examination of such place or building, and if such representation is found to be true, said Commissioner shall give notice in writing to the owner, occupant, lessee, or person in possession, charge or control of such place or building to make such changes, alterations or repairs as safety or the ordinance of the City may require. Upon failure of parties so notified to comply with said notice the matter shall be placed in the Law Department for prosecution.

(c) It shall be unlawful to continue the use of such building until the changes, alterations or repairs found necessary by the Commissioner of Buildings to make such building or part thereof safe or to bring it into compliance with this Chapter, shall have been made.

(d) The Commissioner of Buildings shall have full power to pass upon any question arising under the provisions of this chapter, subject to the conditions, modifications, and limitations contained therein.

202. **Buildings Found in Unsafe Condition—Notice to Owner—Authority of Commissioner.)** (a) Whenever the Commissioner of Buildings shall find any building, or structure or part thereof in the city in

such an unsafe condition as to endanger life, but in such condition that by the immediate application of precautionary measures such danger may be averted, he shall have authority, and it shall be his duty, to forthwith notify, in writing, the owner, agent or person in possession, charge or control of such building or structure or part thereof, to adopt and put into effect such precautionary measures as may be necessary or advisable in order to place such building or structure or part thereof in a safe condition; such notice shall state briefly the nature of the work required to be done and shall specify the time within which the work required to be done shall be completed by the person, firm or corporation notified, which shall be fixed by said Commissioner of Buildings, upon taking into consideration the condition of such building or structure or part thereof, and the danger to life or property which may result from its unsafe condition.

(b) Whenever such Commissioner of Buildings shall be unable to find the owner of such building, structure or part thereof, or any agent or person in possession, charge or control thereof, upon whom such notice may be served, he shall address, stamp and mail such notice to such person or persons at their last known address, and in addition thereto shall place or cause to be placed the notice herein provided for upon such building at or near its principal entrance, and shall also post or cause to be posted in a conspicuous place at each entrance to such building, in large letters, a notice as follows:

"THIS BUILDING IS IN A DANGEROUS CONDITION AND HAS BEEN CONDEMNED BY THE COMMISSIONER OF BUILDINGS."

(c) It shall be unlawful for any person, firm or corporation to remove said notice or notices without written permission from the Commissioner of Buildings.

(d) If at the expiration of the time specified in such notice for the completion of the work required to be done by the terms of such notice, in order to render the building or structure safe, said notice shall not have been complied with, and said building or structure is in such an unsafe condition as to endanger life or property, it shall be the duty of the Commissioner of Buildings to proceed forthwith to tear down or destroy that part of said building or structure that is in such unsafe condition as to endanger life or property, and in cases where an unsafe building or structure cannot be repaired or rendered safe by the application of precautionary measures, such building or structure, or the dangerous parts thereof, shall be torn down by said Commissioner of Buildings or by his order and the expense of tearing down any part of such building or structure shall be charged to the person owning or in possession, charge or control of such building or structure or part thereof, and the said commissioner shall recover or cause to be recovered from such owner or person in possession, charge or control thereof the cost of doing such work, by legal proceedings prosecuted by the Law Department.

(e) If the owner, agent or person in possession, charge or control of such building or structure, or part thereof, when so notified, shall fail, neglect or refuse to place such building or structure, or part thereof, in a safe condition, and to adopt such precautionary measures as shall have been specified by said commissioner within the time specified in such notice, in such case, at the expiration of such time it shall be unlawful for any person, firm or corporation to occupy or use said building or structure, or any part thereof, until said building or structure or part thereof is placed in a safe condition; and in case where a building or structure, or part thereof, is in a dangerous or unsafe condition and has not been placed in a safe condition within the time specified in the notice of the Commissioner of Buildings, such building or structure, or such part thereof, shall be forthwith vacated, and it shall be unlawful for any person or persons to enter same except for the purpose of making repairs required by the Commissioner of Buildings and the ordinances of the City of Chicago.

203. **Building or Part of Building Constructed or Being Constructed in Violation of Chapter—Authority of Commissioner to Tear Down.)** (a) Whenever it shall be found that any building or structure, or part thereof, is being, or shall have been constructed or built in violation of any of the provisions of this chapter, the Commissioner of Buildings shall forthwith notify the owner, agent, superintendent or architect of, or the contractor engaged in erecting such building or structure, or part thereof, of the fact that such building or structure, or part thereof, has been, or is being, constructed or erected contrary to the provisions of this chapter, and shall specify briefly in such notice in what manner the provisions of this chapter, or any of them, have been violated, and shall require the person so notified to forthwith make such building, structure, or part thereof, conform to and comply with the provisions of this chapter, specifying in such notice the time within which such work shall be done.

(b) If, at the expiration of the time set forth in such notice, the person so notified shall have refused, neglected or failed to comply with the request made in such notice and to have such building or structure, or part thereof, concerning which notice was sent, changed so as to conform to and comply with the provisions of this chapter, the Commissioner of Buildings shall have the authority, and it shall be his duty to proceed forthwith to tear down or cause to be torn down such building or structure, or such part thereof as shall or may have been erected and constructed in violation of the provisions or any of the provisions of this chapter, and the cost of such work shall be charged to and recovered from the owner of such building or structure or from the person for whom such building or structure is being erected, in legal proceedings prosecuted by the Law Department.

204. **May Direct Fire Department to Remove.)** The Commissioner of Buildings shall have authority to direct the Fire Marshal to tear down any defective or dangerous wall or structure or any building or structure or part thereof which may be constructed in violation of the terms of this chapter, after written notice has been served upon the owner, lessee, occupant, agent or person in possession, charge or control, directing him or them to tear down or remove any defective wall, building or structure, or any part thereof, which is in a dangerous condition, which has been, or is being, constructed or maintained in violation of the terms of this chapter. In case of the destruction or partial destruction of buildings by fire, decay or otherwise, when any department of the city government, pursuant to the ordinances of the city, shall make an outlay of money or incur any liability for the payment of any expense on behalf of the city in an effort to preserve or prevent the destruction of such building or buildings, or structure, or for the preservation of life of its citizens, it shall be the duty of the Commissioner of Buildings to ascertain the amount of such outlay or expenditure and present a bill therefor to the owner or owners of any such building or buildings, or its or their agent or agents, and it shall be the duty of said Commis-

sioner of Buildings to refuse to issue a permit for the construction, re-construction, alteration or repair of any building or buildings or structure by any such owner or owners, lessee, occupant, agent or person in possession, charge or control thereof until such outlay or expenditure shall be repaid to the city by the owner, lessee, occupant, agent or person in possession, charge or control of such building or buildings thus totally or partially destroyed in the manner aforesaid. Said commissioner shall also proceed forthwith to collect the amount of such bill from such owner or owners, by legal proceedings prosecuted by the Law Department.

205. **May Stop Construction and Wrecking of Buildings.)** (a) Said commissioner shall have power to stop the construction of any building or the making of any alterations or repairs of any building within said city when the same is being done in a reckless or careless manner or in violation of any ordinance, and to order, in writing or by parole, any and all persons in any way or manner whatever engaged in so constructing, altering or repairing any such building, to stop and desist therefrom.

(b) And the said commissioner shall have power to stop the wrecking or tearing down of any building or structure within said city when the same is being done in a reckless or careless manner or in violation of any ordinance or in such a manner as to endanger life or property, and to order any and all persons engaged in said work to stop and desist therefrom. When such work has been stopped by the order of said commissioner, it shall not be resumed until said commissioner shall be satisfied that adequate precautions will be taken for the protection of life and property, and that said work will be prosecuted carefully and in conformity with the ordinances of the city.

206. **Arbitration—Appeal from Decision.)** (a) In all cases where discretionary power is given to the Commissioner of Buildings to estimate damage to buildings, as also in questions relating to the security of any building or buildings or structures, or part thereof, and in all other cases where discretionary powers are given by ordinance to the Commissioner of Buildings, any party or parties believing themselves injured or wronged by the decision of the Commissioner of Buildings must, before instituting any suit, make an appeal for arbitration as follows, to-wit:

(b) Any person wishing to make an appeal shall do so within five days after written notice of the decision or order of the Commissioner of Buildings has been given. An appeal made later than five days after the serving of the notice of the Commissioner of Buildings shall not entitle the appellant to any arbitration. The request for arbitration shall be in writing and shall state the object of the proposed arbitration and the name of the person who is to represent the appellant as arbitrator.

(c) The Commissioner of Buildings shall thereupon inform the appellant of the cost of such arbitration and such appellant shall, within twenty-four hours from the receipt of such information, deposit with the Commissioner of Buildings the sum of money requested for defraying the expense of the same, which sum shall be fixed in each case by said commissioner in proportion to the time it will take and the difficulty and importance of the case, but shall in no case be more than the cost of similar service in the course of ordinary business of private individuals or corporations. As soon as such sum of money shall have been deposited with him, the Commissioner of Buildings shall appoint an arbitrator to represent the city and the two arbitrators thus chosen shall, if they cannot agree, select a third arbitrator, and the decision of any two of these arbitrators shall, after investigation and consideration of the matter in question, be final and binding upon the appellant as well as the city unless an appeal is taken therefrom, as provided in case of an appeal under a statutory arbitration, within five days thereafter.

207. **Arbitrators to Take Oath—Power to Examine Witnesses.)** The arbitrators shall themselves, before entering upon the discharge of their duties, be placed under oath by the City Clerk, to the effect that they are unprejudiced as to the matter in question and that they will faithfully discharge the duties of their position. They shall have the power to call witnesses and place them under oath, and their decision or award shall be rendered in writing, both to the Commissioner of Buildings and to the appellant. The fee deposited by the appellant with the Commissioner of Buildings shall be paid by the Commissioner of Buildings to the arbitrators upon the rendering of their report and shall be in full of all costs incident to the arbitration; but should the decision of said board of arbitration be rendered against the Commissioner of Buildings, then the money deposited by the aforesaid appellant shall be returned to him and the entire cost of such arbitration shall be paid by the city.

208. **In Urgent Cases—Commissioner's Power Final.)** Whenever the decision of the Commissioner of Buildings upon the safety of any building or any part thereof is made in a case which is so urgent that failure to properly carry out his orders to demolish or strengthen such building or part thereof may endanger life and limb, the decision and order of the Commissioner of Buildings shall be absolute and final.

209. **Duty of Police to Assist Commissioner in Enforcing Provisions of this Chapter.)** Whenever it shall be necessary, in the opinion of the Commissioner of Buildings, to call upon the Department of Police for aid or assistance in carrying out or enforcing any of the provisions of this chapter, he shall have the authority so to do, and it shall be the duty of the Department of Police, or of any member of said department, when called upon by said commissioner, to act according to the instructions of, and to perform such duties as may be required by said commissioner in order to enforce or put into effect the provisions of this chapter.

210. **Certificates—Notices—Register.)** (a) The Commissioner of Buildings shall sign or cause to be signed all certificates and notices required to be issued from the Department of Buildings and shall keep a record of the same, and shall issue or cause to be issued all permits authorized by this chapter.

(b) He shall also keep a proper record of all transactions and operations of the department and such record shall be at all times open to the inspection of the Mayor, Comptroller, Superintendent of Police, Fire Marshal and members of the City Council.

211. **Must Keep Account of Fees Paid—Annual Reports and Estimates.)** (a) Said commissioner shall keep in proper books for that purpose an accurate account of all fees charged, giving the name of person to whom same is charged, date on which said charge is made, and the amount of each such fee.

(b) He shall also, annually, on or before the first day of February in each year prepare and present to the City Council a report showing the receipts and expenditures and entire work of the Department of Buildings during the previous fiscal year and he shall on or before November first of each year

prepare and submit to the Comptroller an estimate of the whole cost and expense of providing for and maintaining his office during the ensuing fiscal year.

212. **Examination and Approval of Plans —Record of Inspections and Complaints.)** The Commissioner of Buildings and his assistants shall pass upon all questions relating to the strength and durability of buildings or structures; shall examine and approve all plans before a permit is issued for the construction of any building or structure. The Commissioner of Buildings shall cause to be kept a complete record showing the location and character of every building or other structure for which a permit is issued and shall cause to be filed every report of inspection made on such building, which reports shall bear the signatures of the inspectors making such inspections. He shall cause to be kept a record of all complaints of violations of the building laws and shall cause all such complaints to be investigated.

213. **Deputy Commissioner of Buildings —Duty.)** (a) There is hereby created the office of Deputy Commissioner of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person certified to fill this office shall be either a civil, structural or architectural engineer or an architect, an experienced building contractor or an efficient building mechanic with at least five years' experience and training.

(b) The Deputy Commissioner of Buildings shall act as Commissioner of Buildings in the absence of the Commissioner of Buildings from his office and while so acting shall discharge all the duties and possess all the powers imposed upon or vested in the Commissioner of Buildings.

(c) The Deputy Commissioner of Buildings shall have general control of the work which is under the immediate charge of the Building Inspector in Charge and of that which is under the immediate charge of the Engineer in Charge, and shall have immediate charge of the work assigned to the Elevator Inspectors and to the Fire Escape Inspectors, and shall perform such other duties as may be required of him by the Commissioner of Buildings.

214. **Engineer in Charge—Duties.)** (a) There is hereby created the office of Engineer in Charge, of the Department of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person certified to fill this position shall be a civil, structural, or architectural engineer of at least five years' experience and training.

(b) The Engineer in Charge shall be in immediate charge of the engineering work and staff of the Department of Buildings. The examination of plans submitted for the purpose of obtaining a permit, except as to matters elsewhere expressly assigned by law to some other department of the city government, shall be the duty of the Engineer in Charge and the engineering staff under his charge. The approval and stamp of the Engineer in Charge shall be required on the plans for the erection, enlargement, alteration, repair or removal of every building before a permit for such erection, enlargement, alteration, repair or removal shall be issued. The Engineer in Charge shall have charge of all tests of materials and systems of construction submitted for the approval of the Commissioner of Buildings. The Engineer in Charge shall pass upon the number, location, width and design of all fire-escapes required for new buildings, and he shall also pass upon the number, location, width and design of fire-escapes to be erected on existing buildings wherever such existing buildings are being enlarged, altered or remodeled under a building permit issued for such enlargement, alteration or remodeling. He shall perform such other duties as may be required of him by the Commissioner of Buildings.

215. **Assistant Engineer in Charge— Duties.)** (a) There is hereby created, the office of Assistant Engineer in Charge, of the Department of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person certified to fill this position shall be a civil, structural or architectural engineer of at least five years experience and training.

(b) In the absence of the Engineer in Charge, the Assistant Engineer in Charge shall act as Engineer in Charge. The Assistant Engineer in Charge shall perform such other duties as may be required of him by the Engineer in Charge.

216. **Engineering Staff.)** (a) The Commissioner of Buildings shall appoint according to law at least four Architectural Engineers, and such other engineers and assistants as the City Council may by ordinance provide, for service on the engineering staff of the Department of Buildings. Every person certified to fill the position of Architectural Engineer shall be a civil, structural or architectural engineer of at least five years' training and experience.

(b) The Architectural Engineers shall, under the direction of the Engineer in Charge, examine all plans submitted for the purpose of obtaining a permit. They shall also examine and verify the figures on all floor load placards before such placards are approved for posting. They shall perform such other duties as may be required of them by the Engineer in Charge.

217. **Building Inspector in Charge— Duties.)** (a) The office of Assistant Deputy Commissioner of Buildings is hereby abolished and in lieu thereof there is hereby created the office of Building Inspector in Charge of the Department of Buildings. He shall be appointed by the Commissioner of Buildings according to law. The person certified to fill this position shall be a civil, structural, architectural or fire protection engineer, or an architect, or a building superintendent or a building mechanic with at least five years' experience in general building construction.

(b) In the absence of the Commissioner of Buildings and the Deputy Commissioner of Buildings from their offices the Building Inspector in Charge shall act as Commissioner of Buildings, and while so acting he shall discharge all of the duties and possess all of the powers imposed upon or vested in the Commissioner of Buildings.

(c) He shall have immediate charge of the periodical inspection of buildings and of the inspection of buildings and structures being erected, enlarged, altered or repaired, excepting only such inspection as is expressly assigned to the elevator or fire-escape inspectors or is by law assigned to some other department of the city government.

218. **Assistant Building Inspectors In Charge.)** (a) The Commissioner of Buildings shall appoint, according to law, at least four Assistant Building Inspectors in Charge.

(b) Every person certified to fill the position of Assistant Building Inspector in Charge shall be a civil, structural, architectural or fire protection engineer, or an architect, or a building superintendent or a building mechanic with at least five years' experience in general building construction. The Assistant Building Inspectors in Charge shall have immediate charge of the several districts assigned to them by the Commissioner of Buildings and shall perform such other duties as the Commissioner of Buildings shall require of them.

219. **Building Inspectors.)** (a) The Commissioner of Buildings shall appoint according to law such Building Inspectors as may be necessary.

(b) Every person certified to fill the position of Building Inspector shall be a civil, structural, architectural or fire protection engineer, or an architect, or a building superintendent or a building mechanic with at least five years' experience in general building construction. The Building Inspectors shall, under the direction of the Building Inspector in Charge, examine all buildings and structures in the course of erection, enlargement, alteration, repair or removal, as often as is required for efficient supervision, and shall make such periodical examinations of existing structures as shall be assigned to them. They shall examine all buildings, structures and walls reported to be in dangerous condition. They shall examine all buildings and other structures for the enlarging, altering, raising or removing of which, application for permit shall be made.

(c) Every building inspector shall make written reports daily to the Commissioner of Buildings as to the condition in which he found each building examined and as to violations, if any, of the ordinances which the Commissioner of Buildings is required to enforce, together with the street and number of the premises where such violations, if any, were found, the names of the owner, agent, lessee and occupant thereof, and of the architect and the contractor engaged in and about the work in question. The Building Inspectors shall perform such other duties as may be required of them by the Commissioner of Buildings.

220. **Elevator Inspector in Charge.)** (a) There is hereby created the office of Elevator Inspector in Charge. He shall be appointed by the Commissioner of Buildings according to law.

(b) The person certified to fill the position of Elevator Inspector in Charge, shall be a graduate in engineering from a recognized technical school, shall be versed in the essentials of both mechanical and electrical engineering and shall have had at least five years experience in shop or construction work.

(c) The Elevator Inspector in Charge shall examine all plans for the installation of elevators and for the installation of mechanical devices and apparatus in theaters, amusement parks and the like, and, no such elevator, mechanical device or apparatus shall be installed or operated without the approval of the Elevator Inspector in Charge. The Elevator Inspector in Charge shall cause such inspection to be made of all new installations, as may be necessary to insure the carrying out of the approved plans and shall cause such periodic inspection to be made of existing installations of such mechanisms, devices and apparatus, as may be required by the Commissioner of Buildings, and shall perform such other duties as may be required of him by the Commissioner of Buildings.

221. **Elevator Inspectors.)** (a) The Commissioner of Buildings shall appoint according to law such Elevator Inspectors as may be necessary.

(b) Every person certified to fill the position of Elevator Inspector shall be a mechanical engineer, machinist or elevator builder, and shall be well grounded in the rudiments of mechanical and electrical engineering.

(c) The Elevator Inspectors shall inspect all elevators and such other mechanisms, devices and apparatus as shall be assigned to them by the Inspector in Charge, both existing and in process of being erected or installed, together with all the equipment and enclosures thereof. They shall make written reports daily to the Commissioner of Buildings as to the condition in which they find the elevators, equipment, enclosures, mechanisms, devices and apparatus, inspected by them, and of any violations of the requirements of this Chapter pertaining to such matters, together with the street and number of the premises where such violations, if any, occur, the names of the owner, agent, lessee and occupant thereof, and of the architect and contractor engaged in or about the construction and installation of such elevators, equipment, enclosures, mechanisms, devices or apparatus. They shall perform such other duties as may be required of them by the Commissioner of Buildings.

222. **Fire-escape Inspector in Charge.)** (a) There is hereby created the office of Fire-escape Inspector in Charge. He shall be appointed by the Commissioner of Buildings according to law.

(b) The person certified to fill the position of Fire-escape Inspector in Charge shall be a civil, structural or architectural engineer, or a man who has had not less than five years' experience in the design and erection of structural steel or in the design and construction of fire-escapes, and he shall be qualified to make all necessary computations as to the strength of any fire-escape, the design of which may be submitted for approval and to pass upon the relative merits of such various types of design as may be so submitted.

(c) The Fire-escape Inspector in Charge shall have immediate charge of the inspection of the erection of all fire-escapes and of the periodic inspection of fire-escapes, and shall pass upon the number, location, width and design of fire-escapes to be erected upon existing buildings, except where the existing building is being enlarged, altered or remodeled under a building permit issued for such enlargement, alteration or remodeling, in which case the Engineer in Charge shall pass upon the number, location, width and design of all fire-escapes required for new buildings. The Fire-escape Inspector in Charge shall also perform such other duties as may be required of him by the Commissioner of Building.

223. **Fire-escape Inspectors.)** (a) The Commissioner of Buildings shall appoint according to law such Fire-escape Inspectors as may be necessary.

(b) Every person certified to fill the position of Fire-escape Inspector shall be a person who has had at least four years' experience in superintending the erection of buildings, or in the design or erection of fire-escapes or other steel construction, or who is a graduate of a recognized technical school.

(c) The Fire-escape Inspectors shall, under the direction of the Fire-escape Inspector in Charge, inspect all fire-escapes in course of erection and shall make periodic inspection of the fire-escape equipment of existing buildings. Every such inspector shall make, daily, a written report to the Commissioner of Buildings as to the condition of the fire-escape equipment of each building or premises examined, as to the accessibility of and means of egress to such equipment, as to the presumptive adequacy of such equipment, and as to any violations of any ordinance in relation to such equipment, together with the street and number of the building or premises inspected, the names of the owner, agent, lessee and occupant thereof and of the architect and contractor, if any, engaged in operation in connection with such equipment. The Fire-escape Inspectors shall perform such other duties as may be required of them by the Commissioner of Buildings.

224. **Secretary—Duties.)** (a) There is hereby created the office of Secretary to the Commissioner of Buildings. He shall be appointed by the Commissioner of Buildings according to law.

(b) The Secretary to the Commissioner of Buildings shall, under the supervision and direction of the Commissioner of Buildings, preserve and keep all books, records and papers belonging to the office of the Department of Buildings or which are required by law to be filed therein. He shall perform such other duties as may be required of him by the Commissioner of Buildings.

225. **Clerical Assistants.)** The Commissioner of Buildings shall appoint according to law, such clerical assistants, stenographers and messengers as may be necessary; and they shall perform such duties as may be required of them by the Commissioner of Buildings.

226. **Bonds.)** The Deputy Commissioner of Buildings, the Engineer in Charge, the Assistant Engineer in Charge, the Building Inspector in Charge, the Assistant Building Inspectors in Charge, the Elevator Inspector in Charge, the Fire-escape Inspector in Charge and the Architectural Engineers shall, before entering upon the duties of their offices or positions, each execute to the City of Chicago a bond, conditioned for the faithful performance of their duties, with such sureties as the City Council shall approve in the following sums: The Deputy Commissioner of Buildings, ten thousand dollars; the Engineer in Charge, the Assistant Engineer in Charge, the Building Inspector in Charge, the Assistant Building Inspectors in Charge, the Elevator Inspector in Charge, the Fire-escape Inspector in Charge, and the Architectural Engineers, five thousand dollars each.

227. **Employees Not to Engage in Another Business.)** Every employee in the Department of Buildings shall devote his entire time to such employment and shall not be engaged in any other business or vocation.

228. **Power of Entry.)** The Commissioner of Buildings and his Assistants are empowered to enter any building or structure or premises, whether completed or in process of erection, for the purpose of determining whether the same has been or is being constructed and maintained in accordance with the provisions of this chapter and it shall be unlawful to exclude them from any such building, structure or premises.

ARTICLE II.

229. **Permits—When Required—Limitations of Time For.)** Before proceeding with the erection, enlargement, alteration, repair or removal of any building or structure in the city, a permit for such erection, enlargement, alteration, repair or removal shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the erection, enlargement, alteration, repair or removal of any building or of any structural part thereof within the city unless such permit shall first have been obtained from the Commissioner of Buildings. And if after such permit shall have been granted, the operations called for by the said permit shall not be begun within six months after the date thereof, or if such operations are not completed within a reasonable time then such permit shall be void, and no operations thereunder shall be begun or completed until an extended permit shall be taken out by the owner or his agent, and a fee of ten per cent. of the original cost of permit shall be charged for such extended permit.

230. **Permits—Application For—How Made—How Recorded—Stamped Plans—How Cared For—Return of Same.)** (a) Application for building permits shall be made by the owner or his agent to the Commissioner of Buildings. When such application is made, plans in conformity with the provisions of this chapter, which have been examined and approved by the Commissioner of Buildings and his assistants, as hereinafter provided for, shall be filed with the Commissioner of Buildings. He shall then issue a permit, and shall file such application, and shall apply to such plans a final official stamp, stating that the drawings to which the same has been applied comply with the terms of this chapter. The plans so stamped shall then be returned to such applicant. True copies of so much of such plans as may be required in the opinion of the Commissioner of Buildings to illustrate the features of construction and equipment of the building referred to, shall be filed with the Commissioner of Buildings, and shall remain on file in his office for a period of six months after the occupation of such building, after which such drawings shall be returned by the Commissioner of Buildings to the person by whom they have been deposited with him, upon demand. It shall not be obligatory upon the Commissioner of Buildings to retain such drawings in his custody for more than six months after the occupation of the building to which they relate.

(b) All plans and drawings for the construction or alteration of any building or other structure for which building permits are required shall, before such permits are issued, be presented to the Commissioner of Health for examination and approval as to the proposed plan for the ventilation of rooms, light and air shafts, windows, the ventilation of water closets, drainage and plumbing. They shall also be presented to the Fire Marshal for approval as to standpipes and all fire-fighting apparatus, where same are required. They shall also be presented to the Boiler Inspector and Smoke Inspector in all cases where permits from these departments are required to be procured by the ordinances of the city.

(c) The Commissioner of Buildings shall not issue any permit authorizing the construction, erection, repair or alteration of any building or structure unless the plans submitted for his approval clearly show that such building or structure with all its appurtenances, foundations and attachments can be erected entirely within the limits of the lot or tract of land upon which it is proposed to erect such building or structure, except as provided by the ordinances of the City of Chicago, and no permit to erect, repair or alter any building or structure shall authorize the use of any part of any public highway or other public ground for the construction or maintenance of such building or structure except as provided by the ordinances of the City of Chicago, nor shall any permit be issued for the construction or maintenance of any balcony or canopy extending over any public highway or other public ground unless permits therefor have been obtained from the proper department of the city government pursuant to an ordinance specifically authorizing the same. The plans of every building or structure which show that any part of said building or structure, or any of its appurtenances, or any attachments thereto, extend over any part of any public highway or other public ground shall first be submitted to the Commissioner of Public Works and notice thereby given to him of the proposed encroachment upon any public highway or other public ground. Proof of such notice to the Commissioner of Public Works must be presented to the Commissioner of Buildings before a permit for any such building

or structure shall be issued by said Commissioner of Buildings; and no permit issued by the Commissioner of Buildings shall authorize any encroachment upon any part of any public highway or other public ground.

(d) In all cases, the approved plan, together with building permits, must be kept on the job while the work is in progress.

231. **Plans—Essentials Of.)** All such plans and drawings shall be drawn to a scale of not less than one-eighth of an inch to the foot, on paper or cloth, in ink, or by some process that will not fade or obliterate. All distances and dimensions shall be accurately figured, and drawings made explicit and complete, showing the lot lines and the entire sewerage and drain pipes and the location of all plumbing fixtures within such building. Each set of plans presented shall be approved by the Commissioner of Buildings before a permit will be granted. No permit shall be granted or plans approved unless such plans are signed and sealed by a licensed architect, as provided in "An Act to provide for the licensing of architects and regulating the practice of architecture as a profession in the State of Illinois," approved June 3, 1897.

232. **Plans—Alterations Upon Stamped Plans Not Permitted Without Permission—Certain Alterations Excepted.)** It shall be unlawful to erase, alter or modify any lines, figures, or coloring contained upon such drawings so stamped by the Commissioner of Buildings or filed with him for reference. If, during the progress of the execution of such work, it is desired to deviate in any manner affecting the construction or other essentials of the building from the terms of the application, or drawing, notice of such intention to alter or deviate shall be given to the Commissioner of Buildings, and his written assent shall first be obtained before such alteration or deviation may be made; but alterations in buildings which do not involve any change in their structural parts or of their stairways, elevators, fire-escapes or other means of communication or ingress or egress or in lighting or ventilation and that are not in violation of any of the provisions of this chapter, may be made without the permission of the Commissioner of Buildings.

233. **Deposit With Water Department—How Made—Indemnifying Bonds—Fees for Water Used.)** (a) Before the Commissioner of Buildings issues a permit as aforesaid he shall require evidence from the applicant that payment has been made to the Bureau of Water of the city for the water to be used or for a water meter for measuring all the water to be used in the construction of such building, under the regulations of the Bureau of Water. Such applicant shall produce evidence that he has filed with and had approved by the Commissioner of Public Works of the city an indemnifying bond protecting the city against any and all damage that may arise to the streets or alleys upon which such building abuts, and to the city and to any person in consequence, or by reason of, the proposed operations to be authorized by such permit, or by reason of any obstruction or occupation of any street or sidewalk in and about such building operations.

(b) The fees to be paid for water used in connection with the erection of buildings shall be as follows, to-wit:

At the rate of five cents for every one thousand bricks, wall measure, used in connection therewith.

At the rate of six cents for every one hundred cubic feet of rubble stone used in connection therewith.

At the rate of eight cents for every one hundred cubic feet of concrete used in connection therewith.

At the rate of fifteen cents for every one hundred yards of plastering used in connection therewith.

At the rate of five cents for every one hundred cubic feet of hollow tile arch, partition or fireproof covering used in connection therewith.

234. **Amount of Permit Fees.)** (a) The fees to be charged for building permits shall be as follows: For sheds not exceeding three hundred square feet in area, Two Dollars; for open shelter sheds, at the rate of Fifty Cents for each one thousand cubic feet or fractional part thereof; for all buildings or other structures, other than sheds and open shelter sheds, as hereinafter described, the fee for the permit shall be at the rate of Ten Cents for every one thousand cubic feet or fractional part thereof contained therein, the cubic contents being measured to include every part of the building from the basement floor to the highest point of the roof, and to include all bay windows and other projections; but in no case, shall any permit be issued for a less fee than Two Dollars, except that a fee of One Dollar shall be charged for recovering or recoating the roof of any building.

(b) The fee to be charged for permits issued for alterations and repairs in or to any building or other structure shall be based on the cost of such alterations and repairs and shall be at the rate of Two Dollars for each Five Thousand Dollars or part thereof to be expended therefor. The fee for permit to raise any building other than a frame building shall be Two Dollars for every twenty-five feet or fractional part thereof of frontage.

(c) In addition to the above permit fees for buildings, permit and inspection fee shall be charged as follows:

For erection of fire-escape, $2.00;

For installation or alteration of elevator, $2.00;

For semi-annual inspection of elevator, $2.00;

For erection of billboard or signboard, $2.00 for every 25 lineal feet or fractional part thereof;

For annual inspection of billboard or signboard, 35 cents for each 25 lineal feet of billboard or signboard or fractional part thereof;

For erection of illuminated and other roof signs under Section 710 of this Chapter, $50.00 for the first 500 square feet of superficial area or fractional part thereof, and two cents for each additional square foot area;

For annual inspection of illuminated and other roof signs under Section 710 of this Chapter, $50.00;

For tearing down or wrecking a building, $2.00 for every 25 feet of frontage or fractional part thereof;

For annual inspection of building required to be inspected by Section 237 of this Chapter, $2.00 for each 25,000 square feet or fractional part thereof;

For semi-annual inspection of iron, steel or asbestos curtain, $5.00;

For permit for tank on roof in excess of 400-gallon capacity, $5.00.

235. **Permit for Wrecking Building.)** (a) Before proceeding with the wrecking or tearing down of any building or other structure more than one story in height or of any structure of greater area than 2,800 square feet, a permit for such wrecking or tearing down shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the wrecking or tearing down of any building or structure or any structural part of such building or structure unless such permit shall first have been obtained. Application for such permit shall be made by such owner or his agent to the

Commissioner of Buildings who shall issue such permit upon such application and the payment of the fee herein provided for. Such application shall state the location and describe the building which it is proposed to wreck or tear down. The fee for such permit shall be Two Dollars for every twenty-five feet, or fractional part thereof, of frontage. Upon the issuance of such permit, such building may be wrecked or torn down, provided that all the work done thereunder shall be subject to the supervision of the Commissioner of Buildings and to such reasonable restrictions as he may impose in regard to elements of safety and health, and provided, further, that the work shall be kept sprinkled and sufficient scaffolding be provided to insure safety to human life.

(b) Any person, firm or corporation engaged in the wrecking of a building or other structure for which a permit is required, shall file with the City Clerk a bond with sureties satisfactory to the City Comptroller in the sum of Twenty Thousand Dollars, to indemnify the City against any law suits brought or judgments obtained against the City of Chicago or any of its officials, resulting from accidents to persons or property during wrecking operations, and no permit shall be issued for any wrecking work except as hereinabove otherwise provided, until such bond is filed.

236. **Permit—Revocation Of.)** If the work in, upon or about any building shall be conducted in violation of any of the provisions of this chapter, it shall be the duty of the Commissioner of Buildings to revoke the permit for the building or wrecking operations in connection with which such violation shall have taken place. It shall be unlawful, after the revocation of such permit, to proceed with such building or wrecking operations unless such permit shall first have been reinstated or re-issued by the Commissioner of Buildings. Before a permit so revoked may be lawfully re-issued or reinstated, the entire building and building site shall first be put into condition corresponding with the requirements of this chapter, and any work or material applied to the same in violation of any of the provisions of this chapter shall be first removed from such building.

237. **Annual Inspection of Buildings—Stairways and Means of Egress—Inspection Fee.)** (a) The Commissioner of Buildings and his assistants shall make an annual inspection of all theatres and places of amusement, worship, instruction or entertainment, and also of other buildings over two stories in height, except residences, and except tenements three stories or less in height. It shall be the duty of every owner, agent, lessee or occupant of any such building as is referred to in this section and of the person in charge or control of the same to permit the making of such annual inspection by the Commissioner of Buildings, or by a duly authorized Building Inspector, at any time upon demand being duly made.

(b) Whenever any such inspection shows the building to be in compliance with the requirements of this Chapter with respect to stairways, means of egress, and in all other respects, it shall be the duty of the Commissioner of Buildings to issue, or cause to be issued, a certificate setting forth the result of such inspection, containing the date thereof, and a statement to the effect that such building complies in all respects with the provisions of this Chapter, upon the payment of the inspection fee herein required.

(c) It shall be the joint and several duty of the owner, agent, lessee or occupant of the building so inspected and of each and every person in charge and control of the same to frame the said certificate and place it in a conspicuous place near the main entrance of such building.

(d) It shall be the joint and several duty of the owner, agent, lessee or occupant of every building described in this section to provide a typical floor plan of such building reproduced on a sheet eight by ten inches in size. Said plan shall be drawn on as large a scale as will be practicable on such sheet, and said sheet shall also state the street address of such building, and shall give the class of the building, the kind of construction used therein, the height and the number of stories contained therein, the nature of the occupancy, and whether said building is equipped with an approved automatic sprinkler system.

(e) It shall also be the joint and several duty of such owner, agent, lessee or occupant to deliver a copy of said sheet to the Commissioner of Buildings and to frame a copy of said sheet and place the same near the framed certificate hereinabove required.

(f) It shall also be the joint and several duty of the said owner, agent, lessee or occupant to substitute a new sheet for the sheet on file with the Commissioner of Buildings, and also the sheet framed as above required, whenever such changes or alterations are made in such building as will affect the substantial accuracy of the sheet previously furnished such Commissioner and framed as above required.

(g) Where the result of such inspection shall show that such building fails in any respect to comply with the requirements of this Chapter, it shall be the duty of the Commissioner of Buildings to notify the owner, agent, lessee or occupant of such building to this effect and to specify wherein such building fails to comply with the requirements of this chapter; and it shall thereupon become the joint and several duty of such owner, agent, lessee or occupant to proceed forthwith to make whatever changes or alterations may be necessary to make such building comply in all respects with the requirements of this chapter and to complete such changes and alterations within thirty days after the receipt of such notice.

(h) Upon making such annual inspection, it shall be the duty of the owner to pay to the City Collector an annual inspection fee for the same, amounting to $2.00 for each 25,000 square feet of floor area, or fractional part thereof.

238. **Architect Must Certify That Plans Comply With the Building Ordinances.)** It shall be unlawful for any architect, or other person permitted under the laws of the state to make plans, to prepare or submit to the Commissioner of Buildings for his approval any final plans for any building or structure which do not comply with the structural requirements of this chapter. It shall be the duty of the Commissioner of Buildings to require that all plans submitted to him for approval for any building or structure shall be accompanied by a certificate of such architect or such other person preparing such plans that the plans submitted comply with the structural requirements of this chapter.

239. **Constructing Buildings Contrary to Approved Plans.)** (a) It shall be unlawful for any owner, agent or architect, or for any contractor or builder, engaged in erecting or altering any building, to make any departure from the plans as approved by the Commissioner of Buildings, of such nature that such departure involves any violation of the requirements of this Chapter as to buildings of the class in which such building is, or to make any changes in plan or construction, affecting means of egress, ventilation, natural lighting, or sanitary conditions without first obtaining the writ-

ten consent of the Commissioner of Buildings and of the Commissioner of Health for such changes.

(b) No contractor or builder shall begin any work on any building or structure for which a permit is required by this chapter, until such permit shall have been secured.

ARTICLE III.

Classification of Buildings.

240. **Buildings—Class Of.)** (a) All buildings other than sheds and shelter sheds as hereafter described, now existing or hereafter erected, altered or enlarged, shall be classified as follows:

(b) **Class I.)** In Class I shall be included every building other than department stores as described in this chapter, used for the sale, storage, or manufacture of merchandise, and every stable having a ground area of 500 square feet or over.

(c) **Class II.)** In Class II shall be included every building referred to in subdivisions Class IIa, Class IIb and Class IIc.

(d) In Class IIa shall be included every building used for office purposes, and also every building used for club house purposes where sleeping accommodations are provided for less than twenty persons.

(e) In Class IIb shall be included every building used for hotel, club, lodging or rooming house purposes where such building has sleeping accommodations for twenty or more persons.

(f) In Class IIc shall be included every building used for a hospital, for housing the sick and infirm, imbeciles or children, and every jail, police station, asylum, house of correction and detention, and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons.

(g) **Class III.)** In Class III shall be included every building used as a family residence, and also every building used for garage or stabling purposes, and having a ground area of less than 500 square feet.

(h) **Class IV.)** In Class IV shall be included every building referred to in subdivisions Class IVa, Class IVb, Class IVc, and Class IVd, as follows:

(i) In Class IVa shall be included every building used as a church or place of worship.

(j) In Class IVb shall be included every building having a parish hall, lodge hall, dance hall, banquet hall, skating rink, assembly hall, halls used for the purpose of exposition and exhibition, and buildings having a hall for the purpose of instruction other than schools, included in Class VIII, and also every existing building having a hall used for theatrical purposes at the time of the passage of this ordinance, except such buildings as are included in Classes IVa, IVc, IVd, and V.

(k) In Class IVc shall be included every building hereafter erected used for moving picture and vaudeville shows and similar entertainments, where an admission fee is charged and regular performances are given, and where the seating capacity does not exceed three hundred, provided, that every building of Class IVc existing at the time of the passage of this ordinance shall comply with the provisions of Class IVb.

(l) In Class IVd shall be included every grand stand and every baseball athletic and amusement park.

(m) **Class V.)** In Class V shall be included every building which is used as a public theatre where an admission fee is charged and in which movable scenery is used, and every assembly hall hereafter erected having a seating capacity of over 300 and containing a permanent stage on which scenery and theatrical apparatus are used and regular theatrical vaudeville performances are given; provided, however, that public halls and club halls with a seating capacity of less than 600, although occasionally used for theatrical presentations, shall not be construed to be public theatres within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stages thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V as herein defined. Such public halls and club halls shall be included in Class IVb, as defined in this section.

(n) **Class VI.)** In Class VI shall be included every tenement and apartment house or building or portion thereof which is used or intended to be used as a home or residence for two or more families living in separate apartments.

(o) **Class VII.)** In Class VII shall be included every building used for the sale at retail of dry goods and other articles of general merchandise and commonly known and described as a department store.

(p) **Class VIII.)** In Class VIII shall be included every building used for school purposes having a seating capacity of more than 100 students.

(q) Requirements with regard to buildings not within any of the above classes shall be determined by the Commissioner of Buildings, subject to arbitration in the same manner as provided in Sections 206 and 207 of this chapter.

241. **Buildings Used for the Purposes of More Than One Class.)** Where any building is used for the purposes of two or more classes, as herein specified, and defined, such portion of any such building as is devoted to the uses and purposes of any particular class shall be constructed, operated and maintained in accordance with the requirements of this chapter relating to such class, unless such construction shall, in the opinion of the Commissioner of Buildings, prove impracticable, or unless there would be a conflict between the provisions of this chapter relating to the construction of buildings, in either of which cases the provisions which relate to and govern the construction of buildings of the class requiring the best and safest form of construction shall govern the entire building.

242. **Conflict Between Special and General Provisions.)** Whenever any provision or requirement of this chapter relating specifically to the construction, equipment, maintenance, or operation of any building or part of a building used for the purposes of any specified class, shall conflict with the general provisions of this chapter relating to the construction, equipment, maintenance and operation of buildings generally, the special provisions shall govern in each case, except in the case of Section 514, which shall govern in all cases coming within the provisions.

ARTICLE IV.

Class I.

243. **Class I Defined.)** In Class I shall be included every building other than department stores, as described in this chapter, used for the sale, storage or manufacture of merchandise, and every stable having a ground area of 500 square feet or over.

243½. **Must Comply With General and Special Provisions.)** Every building of Class I shall comply with the general provisions of this chapter, and shall, in addition, comply with the following special provisions:

244. **Buildings—Construction of—In Relation to Height.)** (a) The construction of buildings of Class I shall be as follows: Buildings of Class I which are more than 90 feet in height shall be built of fireproof construction.

(b) Buildings of Class I which are less than 90 feet in height and more than 50 feet in height shall be built of slow-burning, mill or fireproof construction.

(c) Buildings of Class I of ordinary construction shall not be built more than four stories in height.

245. **Skeleton Steel Walls—Metal Lath, and Solid Cement Plaster Covers.)** (a) A one or two story building used for the purposes of Class I, no part of which is within twenty feet of any lot line, alley line or street line, having a complete self-supporting steel frame consisting of wall columns, supporting steel trusses, with steel trusses and steel diagonals, designed to resist safely, within the safe limits of stress provided by this chapter, a wind pressure of twenty pounds per square foot, for each and every exterior surface exposed to the wind, in addition to the dead weight of the completed structure, and in addition to the live load of 100 pounds per square foot provided for by this chapter, and any other live loads which may be imposed on such structure, may have exterior walls measuring not less than one and one-third inches thick of metal lath or metal fabric plastered on both sides with a mortar consisting only of Portland cement and torpedo sand. Complete reinforced concrete framework, built in every manner equally as strong and as safe as provided for a steel frame, in this section, may have exterior walls built in the same manner, of the same materials and of the same thickness.

(b) The enclosing walls of buildings which are built not less than fifty feet from any lot, alley or street line, may be made of corrugated iron, supported on a steel frame.

246. **Door Openings—Revolving Doors.)** (a) The aggregate width of door openings at the street level in buildings of Class I shall be equal to the aggregate width of stairways, as specified in Section 666 of this chapter, and all locks used on exit doors or on doors or gates leading to hallways or stairways which lead to exit doors, shall be so arranged that they may be opened from the inside without the use of a key, during business hours, or while such buildings are occupied for any purpose. In every building of this class, every door leading from a loft or space above the first story shall swing into the stair hall, and every door which is a means of exit from any floor above the first, shall swing outwardly from the space or hallway in which said stairway from such upper floor is located. No door when open shall project over a public sidewalk.

(b) Revolving doors shall not be considered as complying with this section unless the revolving wings of such revolving doors are so arranged that by the application of a force slightly more than is necessary to revolve said doors and which one person of ordinary strength is capable of exerting, all the wings of said doors fold flat on each other, and in an outward direction, or unless the revolving wings of said revolving doors are so arranged that they will be readily collapsed or removed by pressure or simple mechanical means to be approved by the Commissioner of Buildings and leave sufficient opening for two or more persons to pass through side by side.

247. **Existing Buildings of Class I—Increasing Height of.)** In all cases where buildings of Class I of ordinary construction built prior to the passage of this ordinance, are to be increased in height above the height of fifty feet, or of mill or slow-burning construction above the height of ninety feet, the additional parts of such buildings shall be constructed as herein provided for buildings over fifty feet in height or over ninety feet in height, respectively, and said additional parts shall be made to conform in all respects to the requirements for buildings of this class more than fifty feet in height or more than ninety feet in height, respectively, before it shall be lawful to occupy them.

248. **Ceiling and Roof—Space Between.)** In buildings of Class I, if the enclosed space between a ceiling and the roof is of greater average height than two feet, access shall be provided by means of at least one stairway not less than three feet wide, leading from a public hallway or corridor.

249. **Fire Walls.)** (a) Buildings occupied by more than one person, firm or corporation, or for more than one business enterprise conducted by the same person, firm or corporation, in separate enclosures on any one floor, shall have a brick dividing wall for every fifty feet of street frontage, if of ordinary construction, or for every eighty feet of street frontage, if of slow-burning or mill construction, and such dividing walls shall extend from the front to the rear wall and such dividing walls and the doors therein shall be built in accordance with the provisions of Section 573 of this chapter.

(b) All of the partitions between the parts of such buildings occupied by different persons, firms or corporations, shall be built of incombustible material from the floor to the floor boards or roof boards next above such story or stories so occupied.

(c) Only metal framed windows glazed with one-quarter inch thick wire glass may be used in such partitions.

250. **Dividing Walls—When Required.)** (a) Dividing walls will be required in buildings of Class I as follows:

(b) Every building of ordinary construction having greater area than 9,000 square feet shall be divided into areas of 9,000 square feet or less by dividing walls; every building of slow-burning or mill construction more than one story in height, having a floor area greater than 12,000 square feet shall be divided into areas of 12,000 square feet or less by dividing walls; every fireproof building more than two stories in height having a floor area greater than 30,000 square feet shall be divided into areas of 30,000 square feet or less by dividing walls.

(c) Where dividing walls are required in any of the above mentioned buildings, such building shall be subdivided by brick walls, built of the thickness given in the table for the thickness of enclosing walls and all doors or other openings in such walls shall have at each side of the same, iron doors, tin clad doors or shutters, as described in Section 573 of this chapter, and said buildings as subdivided shall be provided with stairs and fire escapes the same as hereinafter required; provided, however, that one-story buildings of ordinary mill or slow-burning construction and two-story buildings of fireproof construction of any size when used as one store, room or workshop and occupied by only one person, firm or corporation, may be erected without any dividing walls.

251. **Display of Placard—Indicating Floor Strength.)** (a) It shall be the duty of the owner of every building of Class I now in existence or hereafter erected, or of his agent, or of the occupant, or person in possession, charge or control of same, to affix and display conspicuously on each floor of such building, a placard, stating the uniformly distributed load per square foot of floor surface, which may with safety be applied to that particular floor, as provided by this chapter, or if the strength of different parts of any floor varies, then there shall be such placards for each varying part of such floor. It shall be unlawful to load any such floors or any part thereof to a greater ex-

tent than the loads indicated upon such placard.

(b) It shall be the duty of the occupants of such buildings to maintain such placards during their occupation of the premises and of the owners of buildings, or their agents, to cause the same to be properly affixed with each change of occupation. It shall be the duty of architects of all buildings, to calculate the figures for such placards, which shall be verified and approved by the Commissioner of Buildings before they are affixed upon the respective floors of the different buildings. The calculations and loads shall be in accordance with the provisions of this chapter.

252. **Live Loads for Floors.)** The floors of all buildings of Class I shall be designed and constructed in such a manner as to be capable of bearing, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of 100 pounds for every square foot of surface, and the strength of such building shall be increased above the capacity to carry such a live load of 100 pounds per square foot of floor surface, when the uses to which such building, or part thereof, is to be applied, involve greater stress. The calculations and loads shall be in accordance with the provisions of this chapter.

253. **Elevator Buildings.)** Elevator buildings intended solely for the receipt, storage and delivery of grain in bulk, shall be of fireproof construction as described in this chapter.

ARTICLE V.

Class II.

254. **Class II Defined.)** (a) In Class II shall be included every building referred to in subdivisions Class IIa, Class IIb and Class IIc.

(b) In Class IIa shall be included every building used for office purposes, and also every building used for clubhouse purposes where sleeping accommodations are provided for less than twenty persons.

(c) In Class IIb shall be included every building used for hotel, club, lodging or rooming house purposes where such building has sleeping accommodations for twenty or more persons.

(d) In Class IIc shall be included every building used for a hospital, for housing the sick and infirm, imbeciles, or children, and every jail, police station, asylum, house of correction and detention, and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons.

254½. **Must Comply With General and Special Provisions.)** Every building of Class II shall comply with the general provisions of this chapter, and in addition to the general provisions shall comply with the following special provisions:

255. **Allowance for Live Loads in Construction of Floors of Class II.)** For all buildings of Class II the floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of fifty pounds for every square foot of surface, and such live load shall be computed in accordance with the provisions of this chapter.

256. **Windows and Mechanical Ventilation.)** (a) In every building hereafter erected for or converted to the purposes of this class, courts shall be of the minimum widths and areas prescribed in Section 442 of this chapter, and vent shafts as defined in Section 432 of this chapter, shall be of the following minimum width and areas:

Height of Shaft.	Least Width in Feet.	Square Feet.
1 story	3	21
2 stories	3	22½
3 stories	3	27
4 stories	3	36
5 stories	5	48
6 stories	6	72
7 stories	8	96
8 or more stories	8	120

(b) In every building hereafter erected for or converted to the purposes of this class, every room used as a private sitting room or as a sleeping room, shall have at least one window which opens directly upon a street, alley, yard or court. The total glass area of such window or windows opening directly upon a street, alley, yard or court shall be not less than one-tenth of the floor area of such room. The top of at least one such window shall be at least seven feet above the floor and at least the upper half of such window shall be capable of being opened. No such window shall have a glass area of less than ten square feet unless it be a window in excess of the one-tenth of the floor area as required by this paragraph. Provided that sleeping cells in prisons, jails, police stations and houses of detention need not have each a window opening directly on a street, alley, yard or court if such cells are in a cell block which has windows with a glass area equal to one-fourth of the floor area of such block and arranged so that each window may be opened for one-half of its area, and provided further that such cell block and cells shall be equipped with a system of mechanical ventilation approved by the Commissioner of Health.

(c) In every building hereafter erected for or converted to the purposes of this class, every pantry, bath room and water closet and urinal compartment shall have at least one window which opens directly upon a street, alley, yard, court or vent shaft; the total glass area of such window or windows opening directly upon a street, alley, yard, court or vent shaft shall be not less than one-tenth of the floor area of such room or compartment. The top of at least one such window shall be at least seven feet above the floor and at least the upper half of such window shall be capable of being opened; and no such window shall have a glass area of less than six square feet or a glass width of less than one foot; provided, however, that such room or compartment, if located in the upper story of any such building, may be lighted and ventilated by means of a skylight having a glass area equal to one-tenth of the floor area of the room it serves and be equipped with an efficient ventilator or ventilators equal in effective area to one-twentieth of the floor area of such room; and provided further, that any such room or compartment in a building used for office, club or hotel purposes, in lieu of such window or windows, may be ventilated by an approved mechanical ventilation system which shall effect at least six complete changes of air per hour.

(d) In every building hereafter erected for or converted to office, hotel or club purposes, every room, except a room used as a bakery, which is below street grade and which is frequented by the public or in which there are regularly employed five or more persons, shall be ventilated by an approved mechanical ventilating system which shall effect at least six complete changes of air per hour; provided that in case of store rooms below street grade having 1,500 cubic feet of space per person employed therein two changes of air per hour will be deemed sufficient. In buildings of this class every room, either above or below grade, used as a bakery, shall comply with the provisions of the ordinances of the City of Chicago in respect to bakeries.

(e) In every building hereafter erected for or converted to the purposes of this class, every room not otherwise specifically provided for in this section shall, where practicable, have a window or windows, with a total glass area not less than one-tenth of the floor area of such room, opening directly onto a street, alley, yard or court, and no such window shall have a width of less than one foot or a total glass area of less than ten square feet, unless such window is in excess of the ten per cent of floor area requirement; provided that, if it be impracticable to ventilate any such room by windows as aforesaid, such rooms shall be ventilated by an approved mechanical ventilating system which shall effect at least six complete changes of air per hour; the air supply being taken from the outer air at a point not less than ten feet above the street level.

(f) It shall be the duty of the owner, agent, architect, or party in possession or control of any building in which a mechanical system of ventilation shall have been installed under the requirements of this section, upon completion of such system, to notify the Commissioner of Health in writing at least twenty-four hours in advance of the making of a test of such system; and each such system or unit shall be tested for volumetric efficiency by the owner or his representative in the presence of the representative of the Commissioner of Health and such system shall not be considered as meeting the requirements of this section until it shall have been approved by the Commissioner of Health. Every such mechanical ventilating system shall at all times be kept in good repair and in operation so as to insure the required ventilation of all rooms and compartments planned to be ventilated thereby, during all hours of human accupancy.

Class IIa.

257. **Class IIa Defined.)** In Class IIa shall be included every building used for office purposes, and also every building used for club house purposes where sleeping accommodations are provided for less than twenty persons.

258. **Buildings—Construction of—Height of.)** (a) Buildings of Class IIa which are ninety feet or more in height shall be built entirely of fireproof construction.

(b) Buildings of Class IIa less than ninety feet and more than fifty feet in height shall be built either of slow-burning, mill or fireproof construction.

(c) Buildings of Class IIa not exceeding fifty feet in height may be built of ordinary construction.

Class IIb.

259. **Class IIb Defined.)** In Class IIb shall be included every building used for hotel, club, lodging or rooming house purposes where such building has sleeping accommodations for twenty or more persons.

260. **Buildings—Construction of—Height of.)** (a) Buildings of Class IIb more than five stories and basement high shall be of fireproof construction.

(b) Buildings of Class IIb more than three stories and basement high but not more than five stories and basement high shall be of slow-burning or fireproof construction. In case slow-burning construction be required the cellar and basement construction, including the floor construction of the first story above the cellar or basement, shall be of fireproof construction.

261. **Walls—Divisions and Partitions—Fire Stops.)** (a) In buildings hereafter erected used wholly, or in part for the purposes of Class IIb of ordinary, slow-burning or mill construction, there shall be for every eight rooms in any one story, dividing walls or partitions of incombustible material separating such eight rooms from the contiguous spaces.

(b) In all buildings hereafter erected to be used wholly or in part for the purposes of Class IIb, all elevators and stairs shall be enclosed in partitions of incombustible or fireproof material, and the partitions of all corridors leading to such elevators and stairs shall be of fireproof or incombustible material. Such partitions shall be carried on self-supporting masonry or a framework of steel or iron. Where glass is used in said partitions, the same shall be wired glass set in metal frames but such glass shall not exceed sixty per centum of the superficial area of said partitions.

(c) In all non-fireproof buildings of Class IIb there shall be between joists a stop of brick, concrete or tile not less than four inches in thickness, extending the full height of joists and spaced not more than twenty-five feet apart, measured in the direction of the length of the joist.

262. **Sleeping Stalls in Rooms—When Allowed.)** Sleeping stalls shall not be constructed or used in any room in any building now existing or hereafter erected and devoted, in whole or in part, to the purposes of a lodging or rooming house unless such room has two or more windows which open directly upon a street, alley, yard or court and which windows have a total area equal to at least one-tenth of the floor area of such room, nor unless the semi-partitions forming such stalls are so constructed that there is a clear and unobstructed interval of at least thirty inches between the top of such semi-partitions and the ceiling of the room, nor unless each such stall shall open directly into an aisle or passageway leading directly to a stairway or stairway fire escape, the location of which is indicated by a red sign and at night by a red light also. Such sleeping stalls shall not be installed in any such room in such numbers that there shall be less than 400 cubic feet of air per person when all stalls are occupied to their full capacity. The semi-partitions forming such stalls hereafter constructed shall be of incombustible material.

Class IIc.

263. **Class IIc Defined.)** In Class IIc shall be included every building used for a hospital, for housing the sick and infirm, imbeciles or children and also every jail, police station, asylum, house of correction and detention and also every home for the aged and decrepit, where sleeping accommodations are provided for more than ten persons.

264. **Buildings—Construction of—Height of.)** (a) All buildings of Class IIc more than two stories in height hereafter erected for or converted to the purposes of Class IIc shall be of fireproof construction.

(b) Buildings of Class IIc not more than two stories in height may be of ordinary, mill or slow-burning construction.

265. **Frontage Consents for Hospitals.)** (a) It shall hereafter be unlawful for any person, firm or corporation to erect or locate any hospital for the care, treatment or nursing of two or more insane persons, inebriates or epileptics, or two or more persons suffering from the excessive use of alcoholic liquors, morphine, cocaine, or other similar drugs or narcotics, or for the treatment or nursing of any person or persons affected with any contagious disease or diseases, in any block in which two-thirds of the buildings on both sides of the streets or avenues surrounding said block are used exclusively for residence purposes, unless the written consent for the erection and maintenance of said hospital is secured from the owners of the majority of the frontage on both sides of that portion of all streets or

avenues which surround the square in which said hospital is to be located.

(b) Said written consents, when required by this section, shall be filed with the Commissioner of Buildings before a permit shall be issued for the erection or alteration of a building proposed to be used for hospital purposes, and a copy thereof shall be filed with the Commissioner of Health before he shall recommend that any license be issued by the City for such hospital.

266. **Coves in Rooms and Corridors of Hospitals.)** In every building hereafter constructed for or converted to hospital purposes, in all corridors and rooms used by patients, all intersections of walls, floors and ceilings shall be formed with tangent coves.

267. **Elevators in Hospitals.)** Every building over three stories in height hereafter constructed for or converted to hospital purposes shall have at least one elevator, the floor dimensions of which shall be not less than seven feet by five feet, and said elevator shall be enclosed in a fireproof shaft with incombustible doors closing off each opening and shall comply with all the general provisions of this chapter.

268. **Fire Escapes, Balconies, Platforms.)** All buildings of Class IIc shall be equipped with stairway fire escapes not less than three feet in width which shall, in number, location and structural features, comply with the general provisions of this chapter relating to fire escapes. The balconies and platforms of such fire escapes shall be not less than three feet in width and may be made with a smooth surface of incombustible material laid flush with the floor and with a pitch of one-third inch to the foot.

269. **Standpipes and Portable Hand Pumps.)** (a) On each floor of every building used for the purposes of Class IIc there shall be provided, for each two thousand square feet of floor area or fractional part thereof, at least one portable hand pump of three gallon capacity or one chemical extinguisher of equal capacity, which shall be located and maintained subject to the approval of the Fire Marshal.

(b) In every building more than three stories in height hereafter erected for or converted to the purposes of Class IIc there shall be constructed one or more four-inch stand pipes which shall extend from the basement to the roof and which shall be connected with the house pump and house tank and which shall have a Siamese connection located on the street or alley side of such building for the use of the first department. Each stand pipe shall be provided with one hose connection with fire department thread on the roof of said building, and one connection on each floor and in the basement thereof, with sufficient hose attached on each floor and in the basement so that a stream of water therefrom will reach any point thereof. The pattern, quality, installation and maintenance of such stand pipes, hose and connections shall be subject to the approval of the Fire Marshal.

ARTICLE VI.

Class III.

270. **Class III Defined.)** (a) In Class III shall be included every building used as a family residence, and also every building used for garage or stabling purposes and having a ground area of less than 500 square feet.

270½. **Must Comply With General and Special Provisions.)** Every building of Class III shall comply with the provisions of this chapter, and, in addition to the general provisions, shall comply with the following special provisions:

271. **Buildings—Construction of—Height of—Space Occupied on Lot.)** (a) Every building of Class III which is ninety feet or more in height shall be built entirely of fireproof construction.

(b) Every building of Class III less than ninety feet and more than fifty feet in height shall be built entirely of slow-burning, mill or fireproof construction.

(c) Every building of Class III less than fifty feet in height may be built of ordinary construction.

(d) The amount of space occupied on any lot by Class III buildings shall comply with the requirements of Section 440 of this chapter.

272. **Skylights — Construction of — Glass in.)** (a) The skylight on the roof of every building of Class III erected within the fire limits shall have its sides, sashes and frames constructed of metal or of metal-clad wood on all exterior surfaces.

(b) Such skylights shall be covered by a strong wire netting with mesh not more than one and one-half inches square placed not less than six inches above the glass, supported on uprights of incombustible material, unless wired glass is used.

273. **Allowance of Live Loads in Construction of Floors.)** In every building of Class III, the floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of the floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of 40 pounds for every square foot of surface.

274. **Habitable Rooms—Definition of—Requirements as to Size and Ventilation.)** (a) For the purposes of this chapter the term "habitable room" shall be held to include every room in every building of Classes III and VI, and every room in buildings of other classes if such rooms are used for the purposes of Classes III and VI, in which a family or the individual members thereof regularly sleep or eat or carry on their usual domestic or social vocations or avocations. Laundries, bath rooms, water closet compartments, serving and storage pantries, storage rooms and closets, boiler and machinery rooms, cellars, corridors, and similar spaces used neither frequently nor during extended periods, shall not be deemed as coming within the scope of this term.

(b) In every building hereafter erected for or converted to the purposes of Class III, every habitable room shall have a window or windows with a total glass area equal to at least one-tenth of its floor area, opening onto a street, alley, or yard as defined in Section 432 of this chapter. None of such required windows shall have a glass area of less than ten square feet; and each such window shall have its top not less than seven feet above the floor and shall be so constructed that at least its upper half may be opened its full width. No such habitable room shall have a floor area of less than eighty equare feet, nor a clear height from floor to ceiling of less than eight feet and six inches; provided that at tic rooms need not be eight feet six inches high for more than one-half of their area, and that such attic rooms shall have total cubic contents of not less than seven hundred and fifty cubic feet each.

(c) No living room shall be partitioned off or constructed in any existing building or portion thereof, until plans of such building and room have been filed with, and a permit for such partitioning or constructing obtained from the Commissioner of Buildings and the Commissioner of Health; and every room so partitioned off or constructed shall comply with all the requirements for habitable rooms as contained in this section.

275. **Alcoves.)** Every alcove and alcove room shall comply with the requirements of Section 446 of this chapter.

276. **Pantries, Bath Rooms, Water Closet and Urinal Compartments—Requirements in Relation Thereto.)** In every building hereafter erected for or converted to the purposes of Class III, every pantry, bath room, water closet or urinal compartment shall have at least one window with a glass area of at least six square feet and a minimum width of at least one foot opening upon a street, alley, or yard as defined in Section 432 of this chapter, or upon a vent shaft not less in area than said window; and no habitable room shall open into or connect with a vent shaft thus used.

277. **Bay Windows and Light Shafts—Materials For.)** Bay or oriel windows may be built of combustible material on front or rear elevations of buildings of Class III of two stories or less in height, within the fire limits, provided such bay and oriel windows shall not have a greater width than twelve feet at the wall line of the building, and, provided, that the outside walls, roofs and soffits of such bay or oriel windows, when so constructed, shall be covered with sheet metal or other incombustible material. Light shafts wholly within the walls of a two-story building of Class III may be built of combustible material covered with sheet metal or other incombustible material. In all other cases, bay and oriel windows and light shafts and their supports shall be constructed entirely of incombustible material.

278. **Walls—Brick Walls Upon Wooden Sills—Level of Sills Allowed.)** Every building of Class III not exceeding one story or twenty feet in height from top of sills to the highest point of the roof, and with the side walls not exceeding fourteen feet in height, and with floor area not exceeding twelve hundred square feet, may have brick walls not less than eight inches in thickness erected upon wooden sills, the sills supported on iron, masonry, or concrete supports extending four feet below the surface of the ground, provided that the portion of the supports above the ground may consist of cypress or cedar posts. The foundations under such supports shall be of concrete, stone or brick, each covering not less than five square feet area and not more than eight feet apart, to support with safety the weight that may rest upon them; sills shall be placed not higher than four feet above the established grade of the street upon which the lot fronts and upon which lot the building is erected, where grades are established, and not exceeding seven feet above the ground where grades are not established. Every building more than one story and less than two stories high, having a gable or hip roof with a rise of not more than thirty degrees, may have eight-inch walls of solid brick or stone masonry, provided the side walls do not exceed fourteen feet in height measured from the first floor joist, and provided such building has a floor area not exceeding 1,200 feet and is not over 22 feet in width.

279. **Stairways in Buildings of Class III Hereafter Erected Three Stories or More in Height.)** In every building of Class III hereafter erected, and three stories or more in height, there shall be either two stairways from the first to the top story or one such stairway and a fire escape.

ARTICLE VII.

Class IV.

(NOTE: *See end of ordinance, page 87, for special ordinance on regulations for operating places of amusement.*)

280. **Class IV Defined.)** (a) In Class IV shall be included every building referred to in subdivisions Class IVa, Class IVb, Class IVc and Class IVd, as follows:

(b) In Class IVa shall be included every building used as a church or place of worship.

(c) In Class IVb shall be included every building having a parish hall, lodge hall, dance hall, banquet hall, skating rink, assembly hall, halls used for the purpose of exposition and exhibition, and buildings having a hall for the purpose of instruction, other than schools, included in Class VIII, and also every existing building having a hall used for theatrical purposes at the time of the passage of this ordinance, except such buildings as are included in Classes IVa, IVc, IVd, and V.

(d) Class IVc shall include every building hereafter erected used for moving picture and vaudeville shows and similar entertainments, where an admission fee is charged and regular performances are given, and where the seating capacity does not exceed three hundred; provided, that every building of Class IVc existing at the time of the passage of this ordinance shall comply with the provisions of Class IVb.

(e) In Class IVd shall be included every grandstand and every baseball, athletic and amusement park.

281. **Must Comply with General and Special Provisions.)** Every building or structure of Class IV shall comply with the general provisions of this chapter and shall, in addition, comply with the following special provisions:

282. **Must Comply With All Ordinances.)** It shall be unlawful for any person, firm or corporation, to construct or alter any theatre, except in conformity with the ordinances of the City of Chicago relative thereto, or to operate any theatre that does not conform thereto.

283. **City Officials Empowered to Enter.)** The Commissioner of Buildings, Commissioner of Health, City Electrician, Fire Marshal, Superintendent of Police, and their respective assistants, shall have the right to enter any building used in whole or in part for the purposes of Class IV at any reasonable time, and at any time when occupied by the public, in order to examine such building, and it shall be unlawful for any person to interfere with them in the performance of their duties.

284. **City Officials Empowered to Close.)** The Commissioner of Buildings, Commissioner of Health, Fire Marshal, City Electrician, or Superintendent of Police, or any one of them, shall have the power, and it shall be their joint and several duty, to order any building used wholly or in part for the purposes of Class IV, to be closed, where it is discovered that there is any violation of any of the provisions of this chapter, and kept closed until the same are complied with.

285. **Theaters in Frame Buildings Prohibited.)** On and after June 1, 1911, no frame building or part thereof shall be used as a moving picture, vaudeville or other theatre.

286. **Buildings—Height—Construction—When Used in Part as Class IV.)** Every building higher than sixty feet, used in whole or in part for the purposes of Class IV or connected with or made part of any building so used, shall be entirely of fireproof construction. Every such building less than sixty feet in height shall be made of fireproof, slow-burning or mill construction, except as provided in this chapter.

287. **Class IVa Defined.)** In Class IVa shall be included every building used as a church or place of worship.

288. **Frontage—Seating Less than Eight Hundred.)** Every building of Class IVa hereafter erected containing an aggregate capacity of 800 persons or less, shall have

for the auditorium a frontage upon two open spaces, of which at least one shall be a street, and the other, if not a street, shall be a public or private alley, not less than ten feet wide, opening directly on a public street or alley.

289. **Frontage—Seating Over Eight Hundred.)** Every building of Class IVa hereafter erected containing an aggregate seating capacity greater than eight hundred persons, shall have for the auditorium a frontage upon three open spaces of which at least one shall be a public street and the others, if not streets, shall be public or private alleys of a width of not less than ten feet each, opening directly on a public street or alley.

290. **Construction of.)** (a) Every building of Class IVa, which has a seating capacity of less than 600 may be built of ordinary construction. Every building Class IVa having a seating capacity of more than 600 and less than 1,800 shall be built of slow-burning, mill or fireproof construction.

(b) Every building of Class IVa having an aggregate seating capacity greater than 1,800 persons shall be built of fireproof construction.

291. **Limitations of Floor Level in Class IVa—Height Above Sidewalk.)** (a) The limitations of floor levels in buildings hereafter erected, occupied either wholly or in part for the purposes of Class IVa, shall be as follows:

(b) No auditorium of a greater seating capacity than 1,000, shall have the highest part of its main floor at a greater distance than 10 feet above the adjacent sidewalk grade. No room or rooms having a greater seating capacity than five hundred shall be at a greater distance above the sidewalk grade than twenty feet. No room or rooms used for the purposes of Class IVa having a greater seating capacity than two hundred shall be at a higher level above the sidewalk grade than thirty feet; provided, however, that in the case of a building used either wholly or in part for the purposes of Class IVa, and built of fireproof construction, a room or rooms to be used for the purposes of Class IVa and of an aggregate seating capacity of less than five hundred may be located in any story thereof, but in such case, there shall be at least two separate and distinct flights of stairs from the floor or floors in which such room or rooms are located, to the ground, each of which stairs shall be not less than 4 feet wide in the clear and shall be equipped with emergency exits and not less than one stairway fire escape.

292. **Allowance for Live Loads in Construction of Floors of Buildings of Class IVa—Stairways—Entrances and Exits, Width of.)** Every floor in buildings of Class IVa shall be designed and constructed in such a manner as to be capable of bearing in all its parts, in addition to the weight of floor construction, partitions, and permanent fixtures that may be set upon same, a live load of 100 pounds for every square foot of surface on such floor. The width of stairways in buildings of this class shall be twenty inches for every one hundred of the aggregate seating capacity, and for fractional parts of one hundred seating capacity, a proportionate part of twenty inches shall be added to the width of such stairway, but no stairway in such building shall be less than four feet wide in the clear, except as hereinafter provided, and provided further, that in any such building having a gallery, the seating capacity of which does not exceed two hundred and fifty persons, two separate and distinct stairways, each not less than three feet wide, shall be permitted.

293. **Galleries—Exit and Entrance.)** Distinct and separate exits shall be provided for each gallery. A common place of exit and entrance may serve for the main floor of the auditorium and the gallery or galleries, provided its capacity be equal to the aggregate capacity of all aisles or corridors leading from the main floor and such gallery or galleries to such place of exit or entrance. Not more than two galleries, placed one above the other, shall be permitted in any building of (Class IVa).

294. **Stairways—Aisles—Steps in Aisles—Passageways, Kept Unobstructed.)** (a) Aisles in buildings of Class IVa shall, in the aggregate, be eighteen inches in width for each 100 of the seating capacity of the auditorium, and for fractional parts of 100, a proportionate part of 18 inches shall be added, but no aisle shall be less than two feet six inches in width in its narrowest part. Steps shall be permitted in aisles only as extended from bank to bank, of seats, and wherever the rise from bank to bank of seats is less than five inches, the floor of the aisles shall be made on an inclined plane; and where steps occur in outside aisles or corridors, they shall not be isolated, but shall be grouped together, and there shall be a light so placed as to illuminate such steps in such outside aisles or corridors. All aisles and passageways shall be kept free from all portable furniture and other obstructions, and no person shall be allowed to stand in or occupy any of such aisles or passageways during the services.

(b) Stairways in buildings used for the purposes of Class IVa shall comply with the provisions of Section 308.

295. **Corridors, Passageways, Hallways and Doors—Width of.)** The width of corridors, passageways, hallways and doors, adjacent to, connected with, or a part of the auditorium, shall be computed in the same manner as is herein provided for stairways and aisles, excepting, however, that no such corridor, passageway or hallway shall be less than four feet in width, and no such doorway shall be less than three feet in width.

296. **Seats, Number of, in Rows.)** There shall not be more than fourteen seats in any one row between aisles. Rows of seats shall not be less than two feet eight inches from back to back, and no bank of seats shall be of greater rise than twenty inches.

297. **Emergency Exits—All Doors to Open Outward.)** (a) Emergency exits and outside stairways shall be provided for every building of Class IVa, which has a larger seating capacity than 800. Such emergency exits shall be one-half the aggregate width of the main exits, but no such emergency exits shall be less than three feet in width. Provided, that such stairways may be built inside the walls of the building in a corridor or passageway not less than seven feet wide and enclosed by a fireproof partition not less than four inches thick. Such stairway shall be of fireproof construction. All emergency exits and stairways therefrom shall be kept free from obstructions of any kind including snow and ice.

(b) All doors affording egress, directly or indirectly from the auditorium to a street or alley, shall open outward. Exit doors shall not be obscured by draperies and shall not be locked or fastened in any manner during the time that the building is occupied, and shall be so constructed and maintained that they may be easily opened from within.

298. **Buildings in Which Seats are Not Fixed—Seating Capacity.)** In computing the seating capacity of any room or building used for the purposes of this class in which the seats are not fixed, an allowance of six

square feet of floor area shall be made for each person, and all space between the walls or partitions of such room or building shall be measured in this computation. Provided, that in buildings of Class IVa standing at least seven feet from any other building and not having more than two stories and each floor having its own separate exits, the seating capacity of such floor shall be estimated alone as determining the kind of construction under this article.

299. **Every Portion to Be Lighted When Occupied at Night—Flues.)** Every portion of a building of Class IVa and all outlets therefrom leading to streets or spaces connected therewith, including the vestibules, halls, corridors, passageways, and stairway exits, shall be properly lighted whenever occupied between sunset and sunrise, and the same shall be kept so lighted until the entire audience have left the premises; and every passageway, corridor, stairway and exit shall be provided with a sign indicating the way out of the building, the letters of which shall not be less than six inches in height. All lights indicating exits in vestibules, halls, passageways, corridors or other means of egress from the building shall be controlled by a separate shut-off, located near the main entrance, and controlled only in that particular place. A red light furnished by gas or sperm oil shall be kept burning, in connection with the word "Exit" over every such opening, during the entire time such building is occupied between sunset and sunrise. Flues used to carry off heat from open lights shall be of incombustible material, and shall have at least twelve inches clearance from any combustible material.

Class IVb.

300. **Class IVb Defined.)** In Class IVb shall be included every building having a parish hall, lodge hall, dance hall, banquet hall, skating rink, assembly hall, halls used for the purpose of exposition and exhibition, and buildings having a hall for the purpose of instruction, other than schools, included in Class VIII, and also every existing building having a hall used for theatrical purposes at the time of the passage of this ordinance, except such buildings as are included in Classes IVa, IVc, IVd, and V.

301. **Frontage—Seating Less Than Eight Hundred—Seating More Than Eight Hundred.)** (a) Every building of Class IVb, containing a hall or halls of an aggregate seating capacity of 800 persons or less, shall have a frontage upon two public spaces, of which at least one shall be a street, and the other, if not a street, shall be a public or private alley, not less than ten feet wide, opening directly on a public street or alley.

(b) Buildings of Class IVb, containing halls or rooms, used for the purpose of Class IVb, of greater aggregate seating capacity than 800, shall have a frontage upon three open spaces, of which at least one shall be a public street, while the other two, if not streets, shall be public or private alleys, of a width of not less than ten feet, each opening directly on a public street or alley; provided that a fireproof passageway at grade level, and not less than seven feet in width may be used in place of one such alley, if such passageway connects with a public thoroughfare.

302. **Auxiliary Buildings—Height and Construction of—Communicating Doors.)** (a) Every building hereafter erected and connected with or made part of any building used in whole or in part for the purposes of Class IVb, shall, if sixty or less feet in height, be of fireproof, mill or slow-burning construction, except as otherwise provided in this chapter, and, if more than sixty feet in height, of fireproof construction.

(b) No existing building, other than of fireproof construction, shall be connected to any building of Class IVb now existing or hereafter constructed, unless there is, between such buildings, a fire wall constructed as required by Section 519 of this chapter and extending from the ground to and through the roof.

(c) In all such cases where both buildings are not of fireproof construction, each opening in the intervening walls shall be equipped with automatic double fire-doors as required by Section 573 of this chapter.

303. **Existing Buildings—Used for Class IVb and for Other Purposes.)** No part of an existing building, other than of fireproof construction shall be used for the purposes of Class IVb unless such part is separated from all portions of the same building used for other purposes by a fire wall constructed as required by Section 519 of this chapter and extending from the ground to the roof and unless all openings in such fire wall are equipped with automatic double fire doors as required by Section 573 of this chapter; in which case such other portions may be constructed in the manner permitted for separate buildings of such class.

304. **Construction—Depending on Capacity.)** Every building used for the purposes of Class IVb, hereafter erected, containing a hall or room of an aggregate seating capacity of not more than 1,500 persons, shall be built of mill, slow-burning or fireproof construction. Every building hereafter erected used for theatrical purposes, with a seating capacity greater than three hundred shall be built to conform to the requirements of buildings of Class V hereafter erected. If a hall or room or halls or rooms have a total seating capacity of more than 1,500 persons, such building shall be built of fireproof construction; provided, that buildings mainly used for exposition or exhibition purposes, and not used for theatrical purposes, and not exceeding two stories in height which have for public use only a main floor and one gallery and which have their walls and structural members of incombustible material and which comply with the provisions of this ordinance as to stairways, exits and fire escapes, may have their temporary seats, boxes, show cases, platforms, or booths, constructed of combustible material; provided, however, that any and all draperies, buntings, or other inflammable decorations shall be treated with a fire-retarding solution, subject to the approval of the Fire Marshal.

305. **Buildings in Which Seats Are Not Fixed—Seating Capacity.)** In computing the seating capacity of any room or building used for the purposes of this Class, in which the seats are not fixed, an allowance of six square feet of floor area shall be made for each person, and all space between the walls or partitions of such room or building shall be measured in this computation. Provided, that in buildings of Class IVb standing at least seven feet from any other building and not having more than two stories and each floor having its own separate exits, the seating capacity of each floor shall be estimated alone as determining the kind of construction under this article.

306. **Limitations of Floor Levels—Height Above Sidewalks.)** (a) The following limitations of floor levels in buildings hereafter erected, occupied either wholly or in part for the purposes of Class IVb, shall be as follows: No auditorium of a greater seating capacity than one thousand shall have the highest part of its main floor at a greater distance than ten feet above the adjacent sidewalk grade. No room or rooms having a greater seating capacity than five

hundred shall be at a greater distance above the sidewalk grade than twenty feet. No room or rooms used for the purposes of Class IVb having a greater seating capacity than two hundred shall be at a higher level above the sidewalk grade than thirty feet; provided, however, that in the case of a building used either wholly or in part for the purposes of Class IVb, and built of fireproof construction, a room or rooms to be used for the purposes of Class IVb and of an aggregate seating capacity of less than five hundred may be located in any story thereof, but in such case, there shall be at least two separate and distinct flights of stairs from the floor or floors in which such room or rooms are located, to the ground, each of which stairs shall be not less than four feet wide in the clear and such floor or floors shall be equipped with emergency exits and have not less than one stairway fire escape.

(b) In buildings of fireproof construction hereafter erected, banquet halls or ball rooms having a seating capacity of not more than 900 may be located on any floor. Such banquet halls or ball rooms shall have access to at least two interior stairways and not less than one stairway fire escape, the combined width of which shall be equal to at least 18 inches for each one hundred persons for whom accommodations are provided in said banquet hall or ball room.

(c) No room or hall used for the purpose of a skating rink shall be constructed, operated or maintained above the first floor of any building.

307. **Allowance for Loads in Construction of Floors.)** All floors of all buildings of Class IVb shall be designed and constructed in such a manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floor, in accordance with the general provisions of this chapter.

308. **Stairways—Entrances and Exits—Width of.)** The width of stairways in buildings used wholly or in part for the purposes of Class IVb, shall be 18 inches for every 100 persons of the aggregate seating capacity of all rooms used for the purposes of Class IVb in such buildings; but no stairway in such building shall be less than four feet wide in the clear; provided, that in any such building having a room or rooms, balcony or gallery, used for the purposes of Class IVb, the aggregate seating capacity of which does not exceed 250 persons, two separate and distinct stairways, each three feet wide, shall be permitted, but no such building hereafter erected shall have less than two interior stairways of the width required by this ordinance, and located as far apart as practicable. Every hall or room used for the purposes of Class IVb in a building hereafter erected or converted, shall have access to not less than two stairways. Every stairway shall have handrails on each side thereof; stairways which are over seven feet wide shall have double intermediate handrails with end newel posts at least five and a half feet high; no stairway shall ascend a greater height than 13 feet 6 inches without a level landing, which landing shall be not less than four feet wide measured in the direction of the run of the stairs. Every stairway leading to a box or boxes shall be independent of all other stairs or seats; and such stairway shall not be less than 2 feet 6 inches wide in the clear when such box or boxes seat not to exceed thirty people, and an additional width of one inch shall be added to such stairway for each additional five persons for whom seating capacity is provided.

309. **Balconies and Galleries—Designation of.)** Where there are balconies or galleries, the first balcony or gallery shall be designated "balcony" and the second and third balconies or galleries shall be designated respectively "gallery" and "second gallery."

310. **Balconies and Galleries—Exit and Entrance.)** Distinct and separate places of exit and entrance shall be provided for each gallery. A common place of exit and entrance may serve for the main floor of the auditorium and the balcony, provided its capacity be equal to the aggregate required capacity of all aisles or corridors leading from the main floor and such balcony to such place of exit and entrance.

311. **Aisles—Steps in Aisles—Passageways—Kept Unobstructed—Width of Corridors, Passageways, Hallways and Doors.)** (a) Aisles in rooms used for the purposes of Class IVb shall have in the aggregate a width of 18 inches for each 100 of the seating capacity of such room, and for fractional parts of 100 a proportionate part of 18 inches shall be added; but no aisle shall be less than two feet six inches in width.

(b) Steps shall be permitted in aisles only as extending from bank to bank of seats, and whenever the rise from bank to bank of seats is less than five inches the floor of the aisles shall be made as an inclined plane, and where steps occur in outside aisles or corridors, they shall not be isolated, but shall be grouped together, and there shall be a light so placed as to illuminate such steps in such outside aisles or corridors. All aisles and passageways in such rooms shall be kept free from campstools, sofas, chairs and other obstructions, and no persons shall be allowed to stand in or occupy any of such aisles or passageways during any performance, service, exhibition, lecture, concert, ball, or any public assembly.

(c) Where there are emergency exits located at the sides of such rooms, there shall be a cross aisle giving access to such exits. The location of emergency exits and cross aisles shall be subject to the approval of the Commissioner of Buildings.

312. **Corridors, Passageways, Hallways and Doors—Width of.)** The width of corridors, passageways, hallways and doors adjacent to, connected with or a part of such rooms, shall be computed in the same manner as is herein provided for stairways and aisles, excepting, however, that no such corridor, passageway or hallway shall be less than four feet in width, and no such door shall be less than three feet in width.

313. **Seats—Number in Rows.)** There shall be not more than fourteen seats in any one row between aisles, and in a room or rooms used for the purposes of Class IVb, of a seating capacity greater than 400 persons, there shall be an aisle on each side of any bank of seats, where there are over seven seats in a row. Rows of seats shall not be less than thirty-two inches from back to back and no bank of seats shall be of a greater rise than twenty inches.

314. **Emergency Exits.)** (a) Emergency exits and stairways shall be provided outside of any and all rooms used for the purposes of Class IVb which have a seating capacity larger than eight hundred, and such emergency exits shall have a width equal to one-half of the width provided for the main exits and such emergency exits shall lead directly to a public thoroughfare. Provided, however, that any room or rooms used for the purposes of Class IVb in any building hereafter erected, having a seating capacity of more than 400, shall have emergency exits outside of the walls of such building equal in width to one-half of the exits required for the main exits, and such emergency exits shall lead directly to a

public thoroughfare. Doors leading to emergency exits shall not be less than three feet wide. Stairs shall be not less than four feet wide. Such emergency exits and stairways may be built inside the walls of such building of a width not less than four feet, provided that they are enclosed by a fireproof partition not less than 4 inches thick; and further provided, that the stairs themselves are constructed of incombustible material. Emergency stairways may descend into open spaces or passageways, provided they do not obstruct more than one-half of the width of such open spaces or passageways.

(b) Every stairway fire escape shall be located and constructed in accordance with the requirements of Sections 669, 670 and 673, but in no case shall any room used for the purposes of Class IVb located above the third story of any building have less than one stairway fire escape.

315. **Doors to Open Outward—Draperies.)** (a) All doors affording access directly or indirectly to the street, alley or corridor from any room used for the purposes of Class IVb shall open outward.

(b) It shall be unlawful for any person, firm or corporation to obscure the exit doors of any room of a building of Class IVb as defined in this chapter, by draperies, and during the time any such room or rooms are open to the public, said doors shall not be locked or fastened in any manner so as to prevent them from being easily opened outwardly; and such doors shall be constructed and maintained so as to require no special knowledge or effort to open them from the interior.

316. **Walls Between Auditorium and Stage.)** There shall be a solid brick wall of the same thickness as required for outside walls between the auditorium and stage in buildings hereafter erected for or converted to the use of Class IVb and used either wholly or in part for that purpose; and in existing non-fireproof buildings such wall must extend to a height of three (3) feet above the roof. Provided, however, that in existing buildings any room used for the purposes of Class IVb at the date of the passage of this ordinance having a greater seating capacity than four hundred (400) shall have a proscenium wall built of masonry or incombustible material.

317. **Curtain Shall Be of Iron, Steel or Asbestos—Inspection of—Fee.)** The main curtain opening in any such room shall have a wrought iron or steel or three-ply asbestos curtain with a wire mesh imbedded therein, which shall be inspected by the Building Department semi-annually, for which inspection a charge of five dollars shall be made, and all other openings in the proscenium wall shall have self-closing iron doors.

318. **Structures Over Ceiling—Construction.)** If any structure intended to be occupied by people is built over the ceiling of any room, used wholly or in part for the purposes of Class IVb, the girders or trusses supporting the same shall be of steel protected with fireproofing as required for interior columns in Section 625.

319. **Standpipe and Hose on Stage.)** In every room used for the purpose of Class IVb and having a seating capacity of 250 or more, and where scenery is used a standpipe not less than one and one-half inches in diameter, with a hose connection and hose valve thereon, shall be installed on each side of the stage, and shall at all times have connected thereto and ready for use, a hose of sufficient length to reach any part of the stage. Such standpipes shall be connected with pump or frostproof gravity tank so that a pressure of water of ten pounds per square inch shall be furnished through such standpipe at the highest opening.

320. **Vents or Flue Pipes.)** (a) One or more vents of flue pipes of metal construction or other incombustible material approved by the Commissioner of Buildings shall be built over the stage, and shall extend not less than ten feet above the highest point of the roof, and shall be equivalent in area to one-twentieth of the area of the stage.

(b) In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls, and shall be continued and run up on the exterior of the building to a point five feet above the highest point of the additional stories.

(c) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches, or either of them, fail to operate. Such stations shall be located in such places on the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.

321. **Fuse Boxes.)** Every fuse box shall be surrounded by two thicknesses of fireproof material with an air space between, and no fuse shall be exposed to the air between the switchboards; all electrical equipment in such rooms shall be installed and maintained to the satisfaction and approval of the City Electrician.

322. **Capacity—Certification for License.)** (a) The Commissioner of Buildings shall determine the number of persons which every room used for the purposes of Class IVb may accommodate, according to the provisions of this Chapter, and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.

(b) No amusement license shall be issued for any room used for the purposes of Class IVb, unless the Commissioner of buildings, the Fire Marshal and the City Electrician shall first have certified, in writing, that such room complies with the provisions of this Chapter in every respect.

323. **Exits—Signs at—Lighting Of.)** (a) The word "Exit" shall appear in letters at least six inches high over the openings to every means of egress from every room used for the purposes of Class IVb, and in every such room having a greater seating capacity than 400, a red light furnished by gas or sperm oil shall be provided over such sign.

(b) Every room used for the purposes of Class IVb and all outlets therefrom leading to the streets, including passageways, courts, corridors, stairways, exits, and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such rooms and spaces, and every passageway, court, corridor, stairway, exit, and emergency stairway, shall be provided with signs indicating the way out of the building, the letters of which shall not be less than six inches in height.

324. **Lights in Halls, Corridors and Lobbies—Control Of—Separate Shutoff—Connection with Gas Mains—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of**

Foot Lights—Construction of Border Lights—Ducts and Shafts Conducting Heated Air From Lights—Protection of Stage Lights.) Gas and electric lights in the halls, passageways, corridors, lobbies and other means of ingress to or egress from any such room shall be controlled by a separate shutoff, located in an accessible place, subject to the approval of the Commissioner of Buildings, and controlled only by that particular place. No gas or electric light fixture shall be inserted in the walls, woodwork, ceilings or in any part of any such room, unless protected by fireproof materials. The footlights, if gas light, shall be protected by wire network, and also by a strong wire guard, not less than two feet distant from such footlights and a trough containing such footlights shall be formed of and be surrounded by fireproof materials. Border lights shall be constructed according to the best known methods, subject to the approval of the City Electrician, and shall be suspended by wire rope. Ducts and shafts used for collecting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double with an intervening air space. Stage lights, if gas, shall have strong wire guards or metal screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of flame, and such guards or screens shall be firmly soldered to the fixtures in all cases.

325. **Scenery—Definition—Movable Scenery.)** (a) "Scenery" as used in this chapter shall include all scenery, drop curtains and wings which are constructed or made of cloth, canvas or combustible material, whether stationary or movable.

"Movable scenery" shall include all scenery, drop curtains, borders and wings which are made movable for the purpose of changing scenery and substituting another set during or between the various stage acts.

326. **Scenery to Be Non-Inflammable.)** No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of Class IVb, unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

327. **Amount of Scenery Allowed—Sprinkler System.)** Two sets of house scenery and three drops, exclusive of asbestos fire curtain and picture screen shall be allowed in existing buildings, rooms and theatres of Class IV, and shall be known and designated upon the licenses issued by the City as "Permanent House Scenery", and the use and moving of such scenery shall not be construed as placing said building, hall, room or theatre within the provisions of the ordinance relating to Class V Buildings.

A set of house scenery as contemplated by this section, is hereby defined to mean sufficient scenery to make one stage setting, such scenery being in continuous use in such house; provided, however, that the lowering of a drop shall not constitute a new stage setting.

No other scenery except as above enumerated shall be permitted on, above or underneath the stage.

Every existing Class IV theatre affected by this section shall be equipped with standpipes and hose as required by Section 319 of the Revised Municipal Code of Chicago of 1905, which standpipes shall extend to the underside of the stage ceiling in such locations as shall be approved by the Fire Marshal.

No existing Class IV theatre affected by this section shall increase its seating capacity after the passage of this ordinance.

No scenery or stage paraphernalia of combustible materials shall be used on the stage of any room or theatre used for the purposes of Class IV, unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

328. **Dressing Room Partitions.)** Partitions forming dressing rooms, except where already built, shall be constructed of incombustible material, and such dressing rooms shall be properly ventilated.

329. **Apparatus Under Control of Fire Marshal.)** The standpipes, hose, vent flues and all apparatus for the extinguishing of fire or guarding against the same, required by the provisions of this ordinance to be provided, shall be at all times so provided and kept in a manner satisfactory to the Fire Marshal.

CLASS IVc.

330. **Class IVc Defined.)** Class IVc shall include every building hereafter erected used for moving picture and vaudeville shows and similar entertainments, where an admission fee is charged and regular performances are given, and where the seating capacity does not exceed 300, provided that every building of Class IVc existing at the time of the passing of this ordinance shall comply with the provisions of Class IVb.

331. **Frontage of Class IVc.** Every room used for the purposes of Class IVc, shall have a frontage upon at least two public thoroughfares, of which at least one small be a street and the other a street or a public or private alley not less than ten feet wide, and opening directly on a public street or alley.

332. **Construction.)** Buildings of Class IVc hereafter erected less than thirty feet in height, may be built of ordinary construction, but the enclosing walls shall be constructed of masonry. No moving picture, vaudeville or theatrical show shall hereafter be installed in a frame building. No room or hall used for the purposes of Class IVc shall hereafter be installed underneath any living or sleeping room.

333. **Floor Levels—Limitations.)** The following limitations of floor levels shall apply to every building used for the purposes of Class IVc; the highest part of the auditorium floor shall not exceed four feet above the sidewalk level. The floor level at the entrance shall not be at a greater height than eight inches above the sidewalk. The aisles shall not have a greater incline than 1½ inches to the foot.

334. **Stairways.)** Where external stairways are required, such stairways shall be at least six inches wider than the exits, and shall have treads not less than ten inches wide and risers not more than 8 inches high, and shall be provided with suitable handrails on each side thereof, and the width of such stairs shall comply with the requirements of Class IVb.

335. **Balconies and Galleries.)** In non-fireproof buildings hereafter erected for, or converted to the purposes of Class IVc, not more than one balcony and no galleries shall be constructed.

336. **Aisles—Steps and Aisles—Passages to be Kept Unobstructed.)** Aisles and rooms used for the purposes of Class IVc shall have in the aggregate, a width of not less than 20 inches for each 100 of seating capacity of such room and for fractional parts of 100, a proportionate part of 20 inches shall be added, and no aisle shall

have a width of less than two feet six inches. When side emergency exits are permitted, there shall be a cross aisle not less than three feet wide, leading directly to said exit. Steps shall not be permitted in any aisle or in any portion of the auditorium floor. Every aisle, passageway, entrance and exit shall be free from turnstiles, railings or other obstructions.

337. **Corridors — Passageways — Doors — Width Of.)** The width of corridors, passageways and doors shall be computed in the same manner as provided in Sections 311 and 312.

338. **Seats—Size—Location.)** There shall not be more than ten seats in any one row between aisles, nor more than six seats between an aisle and side wall. Seats shall not be less than thirty-two inches from back to back and shall not be less than twenty inches in width measured at the top of the seat back, and shall be secured firmly to the floor.

339. **Exits.)** In every building of Class IVc, there shall be provided at least two entrance doors. No entrance doors shall be less than four feet in width. If the rear of the building abuts upon an alley, there shall be provided not less than two emergency exits leading directly to the said alley. Wherever emergency exits pass over or under the stage floor level, they shall be enclosed with walls of masonry nine inches in thickness, or four-inch hollow tile, or of two-inch solid plaster, composed of iron studs and metal lath and plaster, and shall have floors and ceilings of slow-burning, mill, or fireproof construction. If the side of the auditorium abuts upon a street or alley, such emergency exits shall be located as follows: one exit shall be located at a distance not greater than five feet from the proscenium wall or stage, and the other exit shall be located at a distance half way between the foyer and the stage wall. Exits by means of stairways or stairway fire escapes, equal in width to eighteen inches for each one hundred persons, shall be provided, and for fractional parts of one hundred, proportionate part of eighteen inches shall be added. No such exit shall be less than two feet six inches in width.

340. **Doors to Open Outward.)** All doors affording ingress or egress in buildings of Class IVc shall open outward, and no door shall be less than three feet wide. Such doors, as well as any entrance or exits or opening, shall not be obscured by curtains or draperies, and no door shall be locked or fastened at any time during the time such building is open to the public, and no door or opening shall be less than three feet wide. Such doors shall be so constructed and maintained that they may easily be opened from within.

341. **Walls Between Auditorium and Stage.)** Where the area of the stage exceeds 72 square feet, there shall be provided a proscenium wall of solid masonry of not less than nine inches in thickness, extending from ground to the roof. Where the stage area is less than 72 square feet its proscenium wall may be constructed of two-inch solid plaster walls, composed of metal studs and metal lath and plaster or three-inch hollow tile. In no case shall the underside of ceiling or roof over stage house behind proscenium wall be at a higher level than three feet over the highest point of main proscenium opening. And there shall be no trap doors or other openings in the stage floor.

342. **Curtain.)** (a) The main curtain in the opening of the proscenium wall shall be composed of long fibre asbestos twisted on brass wire and woven into a close cloth. The laps shall be sewed with two lines of brass and asbestos stitching, which laps shall not be less than one-inch wide. Said cloth shall be lapped at least four times around the top and around the bottom bars with at least three lines of the stitching above specified.

(b) The edge of the curtain shall be continuously reinforced by lapping and stitching and also with pieces of sheet metal for clips. The curtain shall be at least thirty inches wider and higher than the masonry opening, and shall have steel top and bottom bars of not less than two square inches in cross section which bars shall be connected by four three-sixteenth-inch steel cables.

(c) There shall be three-eighth-inch spanning cables with upper ends secured to steel brackets fastened to the wall and the lower ends sufficiently counter-weighted to keep the cables taut and where cables pass through the stage floor, the holes shall be metal bushed.

(d) The curtain shall have hard wood eyelets not over eighteen inches center to center, around the standing cables on both vertical edges, which eyelets shall be secured to the curtain by bent brass clips riveted to the curtain with double sheet metal reinforcing.

(e) There shall be steel lifting cables, one-half inch in diameter, at each end of the curtain and at intermediate points not over ten feet apart attached to drums on shafts located above the curtain.

(f) The operating machinery shall be built according to good mechanical engineering practice.

(g) There shall be emergency chains midway between the lifting cables, to hold the curtain which shall be equal in strength and efficiency to the lifting cables.

(h) There shall be steel guides of not less than three-eighth-inch metal on each side of the curtain from the stage floor to the level of the overhead sheaves. The metal guides shall lap the edges of the curtain not less than four inches. The curtain shall be incombustible in all its parts and its operating devices.

(i) The painting and the manner of tripping the curtain and the number of and the location of places for tripping shall be subject to the approval of the Fire Marshal.

(j) A permit shall be obtained from the Department of Buildings for the erection of each such curtain. The Commissioner of Buildings shall inspect each such curtain semi-annually for which semi-annual inspection, a fee of $5.00 shall be charged.

343. **Other Openings in Stake Walls.)** Every other opening in ' the proscenium wall or in the other walls of the stage shall have self-closing incombustible doors.

344. **Structure Over Ceiling—Construction.)** A structure may be built over the ceiling or roof of any building used wholly or in part for the purposes of Class IVc, provided such space is not used for sleeping or living purposes. Girders or trusses supporting same shall be of steel protected by fireproofing as required in Section 625 and the entire ceiling shall be covered with incombustible material subject to the approval of the Commissioner of Buildings.

345. **Picture Machine Booth.)** The walls, floor and ceiling of every moving picture booth or machine house shall be built of four-inch hollow tile or four-inch solid concrete, supported on iron beams or columns, the door of operating room to be metal clad and swing outwards. There shall be a metal smoke or flue pipe eighteen inches in diameter extending from ceiling to three feet above roof of machine house and terminating in the open air.

346. **Standpipes and Hose on Stage.)** When the stage area exceeds seventy-two square feet and combustible scenery is used

on stage, there shall be a water stand-pipe not less than 1½ inches in diameter with hose connections and hose of sufficient length to reach any and all portions of stage. Said stand-pipe shall be connected to either a fifteen-hundred-gallon frost-proof gravity tank located twenty-five feet above stage level, or to a two-inch city pipe connection, satisfactory to the Fire Marshal.

347. **Vent or Flue Pipe Over Stage.)** (a) When the stage exceeds seventy-two square feet in area and combustible scenery is used, one or more flue pipes of incombustible material and equivalent to one-twentieth of the area of the stage shall be built over the stage and shall extend eight feet above the highest point of roof.

(b) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches or either of them, fail to operate. Such stations shall be located in such places on the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.

348. **Fuse Boxes.)** Every fuse box shall be surrounded by two thicknesses of fireproof material with an air space between, and no fuse shall be exposed to the air between the switch boards; all electrical equipment in such rooms shall be installed and maintained to the satisfaction and approval of the City Electrician.

349. **Capacity—Certification for License.)** The Commissioner of Buildings shall determine the number of persons which every room used for the purposes of Class IVc may accommodate according to the provisions of this chapter, and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.

350. **Exits, Signs and Lights.)** (a) The word "Exit" shall appear in letters six inches high over the openings to every means of egress from such room, and a gas or sperm oil light with red globe shall be provided at or over such exit sign.

(b) Every room used for the purposes of Class IVc and all outlets therefrom leading to the streets, including passageways, courts, corridors, stairways, exits, and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such room and spaces, and every passageway, court, corridor, stairway, exit and emergency stairway, shall be provided with signs indicating the way out of the building, the letters of which, shall not be less than six inches in height.

351. **Lights in Halls, Corridors and Lobbies—Control of—Separate Shutoff—Connection with Gas Mains—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights, Ducts and Shafts Conducting Heated Air From Lights—Protection of Stage Lights.)** Gas and electric lights in the halls, passageways, corridors, lobbies, and other means of ingress to or egress from any such room shall be controlled by a separate shutoff, located in an accessible place, subject to the approval of the Commissioner of Buildings and controlled only in that particular place. No gas or electric light fixtures shall be inserted in the walls, woodwork, ceilings or in any part of any such room, unless protected by fireproof materials. The footlights, if gas lights, shall be protected by wire net work, and also by a strong wire guard, not less than two feet distant from such footlights, and a trough containing such footlights, shall be formed and be surrounded by fireproof materials. Border lights shall be constructed according to the best known methods subject to the approval of the City Electrician and shall be suspended by a wire rope. Ducts and shafts used for collecting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double with an intervening air space. Stage lights, if gas, shall have strong wire guards or metal screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of flame, and such guards or screens shall be firmly soldered to the fixtures in all cases.

352. **Apparatus Under Control of Fire Marshal.)** The standpipe, hose, vent flues, and all apparatus for the extinguishing of fire or guarding against same, required by the provisions of this chapter to be provided, shall be at all times so provided and kept in a manner satisfactory to the Fire Marshal.

353. **Scenery Requirements—Fire Proof Solution.)** (a) All scenery on the stage shall be made stationary, and shall consist of not over two asbestos curtains, three stationary wings on each side and four stationary border drops. All scenery and stage paraphernalia shall be treated with a paint or chemical solution every six months, which shall make it non-inflammable, and which treated scenery or stage paraphernalia shall be tested and approved by the Fire Marshal. Where no combustible scenery is used or where all scenery is made of metal, the smoke flue over the stage and the standpipes may be dispensed with at the discretion of the Commissioner of Buildings and the Fire Marshal.

(b) Scenery supported by and constructed entirely of incombustible material, shall not be considered as sets of scenery provided for in this section.

354. **Dressing Room Partitions.)** Partitions forming dressing rooms, except where already built, shall be constructed of incombustible material, and such dressing rooms shall be properly ventilated.

355. **Frontage Consents Required.)** No building of this class shall hereafter be constructed for, or converted to the use of said class, unless frontage consents are secured as required by the ordinances of the City of Chicago and filed with the Commissioner of Buildings.

356. **Class IVd Defined.)** In Class IVd shall be included every grand stand and every baseball, athletic and amusement park.

357. **Loads—Allowance for Live Loads.)** The floors and stairs of grand stands and bleacher stands, existing or hereafter built, shall be designed and constructed in such manner as to be capable of bearing in all their parts and supports, in addition to the weight of the floor construction, partitions and permanent fixtures, that may be set upon the same, a live load of not less than one hundred pounds for every square foot of surface of said floors, and a live load of not less than one hundred and fifty pounds for every square foot of the bearing surface of the stairs.

*358. **Grandstands—Frame within Fire Limits—Grandstands Hereafter Constructed — Fireproof — Frontage Consents.)** (a)

Wooden grandstands or tiers of seats commonly known and described as grandstands now constructed or in the process of construction may be erected, repaired or enlarged within the fire limits where no part of any such structure shall be within sixty feet of any other building or structure. All grandstands hereafter erected within the fire limits, except as hereinafter provideo, shall be made of fireproof or unprotected steel construction. The enclosing walls, if enclosed, shall be made of fireproof or incombustible materials, but the seats may be made of wood. Grandstands outside the fire limits, or inside the fire limits where the seating capacity does not exceed five thousand persons, may be constructed of wood, but no part of any such structure shall be within less than sixty feet of any other building or structure. The braces, supports and the underside of all seats, including bleacher seats, shall be treated with a fire-retarding solution once a year before opening up the premises containing such stand to the public.

(b) Every person, firm or corporation desiring a permit for the construction of a grandstand, except in connection with such as are now in existence, shall first obtain the consent in writing of the owners of a majority of the frontage on both sides of the street or streets on each side of the block or square in which it is desired to erect such grandstand.

*As amended, Dec. 19, 1910.

359. **Width of Aisles and Exits—Number of Seats Between Aisles.)** (a) The width of aisles and exits in all grandstands contemplated in Section 356, hereafter constructed, shall be in no case less than 36 inches and such width shall be increased toward the exits which serve as regular entrances, such width being computed at the rate of eighteen inches per 100 seats or fractional part thereof in non-fireproof grandstands, and at the rate of twelve inches for each 100 seats or fractional part thereof in fireproof grandstands.

(b) The number of seats between aisles in any row shall not exceed twenty in non-fireproof grandstands, nor thirty in fireproof grandstands.

(c) No exit, gate or door, shall be locked or bolted during the occupancy of such stands by the public. All aisles, passageways, corridors and exits shall be kept free from obstructions of any kind.

360. **Temporary Seating Structures.)** Temporary seating structures for shows and outdoor exhibitions and the observation of holidays and special occasions may be built of combustile material, providing they are built structurally strong enough to support a live load of one hundred pounds per square foot, and comply with the provisions of Class IVb in regard to means of exit, aisles and rows of seats; and provided, further, that a permit be secured from the Commissioner of Buildings, which shall in no case be issued by him until the party desiring to erect said temporary seating structure shall secure the written consent of a majority of the property owners or their duly authorized agents, on both sides of the street between the two nearest intersecting streets on which said temporary seating struction is to be located. And further provided that any permit issued for any such temporary seating structure as hereinabove provided for in this section shall not entitle the person so receiving said permit to use said temporary seating structure for more than ten consecutive days from the first day on which it is so used; and further provided that any temporary seating structure provided for in this section shall be removed within ten days after the use of the same as provided for in this section, and if not so removed it shall be the duty of the Commissioner of Buildings to order the same to be removed or torn down by the Fire Marshal.

361. **Use of Roofs Used for Spectatorial Purposes—Prohibited.)** It shall be unlawful for any person, firm or corporation whether owner, lessee, manager or in possession and control or having charge of any building within the city to permit the use of the roof of any such building, whether free of charge, or through admission fee, to any person or persons as a place of observation or for spectatorial purposes

Amusement Parks.

362. **Roller Coaster Devices.)** No roller coaster, scenic railway, or other riding, sliding, or rolling device, shall be hereafter erected of a greater height from the ground than 55 feet. All such coasters, railways, riding or other devices shall be equipped with safety clutches. The cars, or any receptacles, which persons are permitted to occupy, or in which they are permitted to travel, ascend or descend, shall have hand rails of sufficient number and height to prevent people from being thrown therefrom, and of such character as shall be approved by the Commissioner of Buildings.

363. **Frontage Consents Required.)** It shall hereafter be unlawful for any person, firm or corporation, to build, construct, establish, produce or carry on, any amusement within any ground, garden or enclosure of the kind commonly known and described as amusement parks, wherein shows of different classes are offered or presented by one or more concessionaries, without first securing written frontage consents as required by the ordinances of the City of Chicago. Such frontage consents shall be filed with the Commissioner of Buildings before a permit shall be issued for the construction of any building or structure connected in any way with such amusement park.

364. **Requirements.)** (a) Buildings hereafter erected within an amusement park, located outside the fire limits, shall comply, except as herein otherwise specified, with the provisions of Class IVb.

(b) Buildings hereafter erected within amusement parks located outside of the fire limits and not exceeding one story in height and which do not contain more than one balcony may be built with a self-supporting steel frame designed as required by this chapter. Such structures may be enclosed with metal lath covered with cement plaster, which plaster shall be not less than one and one-third inches thick, or such structures may be enclosed with galvanized iron. The roofs of such structures may be of ordinary construction supported on steel trusses and covered with a gravel or composition roof, approved by the Commissioner of Buildings.

(c) Every moving picture theatre built within an amusement park shall comply with the provisions of Class IVc.

365. **Open Space Between Buildings.)** There shall be an open and unobstructed space of not less than four feet between each and every frame building hereafter erected in an amusement park, where the buildings do not exceed twenty feet in height, and of not less than six feet where the buildings are over twenty feet and less than thirty feet in height, and of not less than ten feet where the buildings are over thirty feet in height. Where brick or concrete or other fireproof walls of full seventeen inches in thickness are used between such buildings and where such buildings are built of slow-burning construction, these spaces shall not be required, but, in such cases, there shall be a space of ten feet in

width at intervals of every two hundred feet.

366. **Standpipes — Fire Plugs — Hose.)** There shall be installed within the grounds of every amusement park, an adequate system of water pipes with branch connection to fire plug, with sufficient hose connected to city pressure, so as to furnish at all times a good and efficient force of water, which will enable the extinguishing of fire at or within each and every building. The size of water mains, standpipes, fire plugs, hose, as well as the location, number, and quantity of same, shall be subject to the approval of the Fire Marshal. All hose connection shall be the standard size used by the Fire Department of Chicago and shall be approved by the Fire Marshal.

367. **Roller Coasters—Scenic Railways, Etc.—Permit Fee—Certificate of Test and Safety.)** Before any roller coaster, scenic railway, water chute, or other mechanical, riding, sailing, sliding or swinging device is erected, either in existing or new amusement parks, a detailed plan shall be submitted to the Commissioner of Buildings, for his approval or rejection, and, if approved, a permit shall be procured by the person, firm or corporation desiring to erect such device. The permit fee shall be fifty dollars for each such device. Before such device is opened to the public each season, a certificate of inspection, signed by a competent engineer, approved by the Commissioner of Buildings, must be furnished, certifying to the practicability, strength and safety of such devices, and all such device or devices shall be examined by the Commissioner of Buildings or his employees upon completion and each year before opening up to the public.

368. **Must Comply With All Ordinances.)** It shall be unlawful for any person, firm or corporation to construct, alter or operate any amusement park or any building or structure therein unless they comply with the ordinances of the city relative thereunto.

ARTICLE VIII.

(NOTE: *See end of ordinance, page 87, for special ordinance on regulations for operating places of amusement.*)

Class V.

369. **Class V Defined.)** In Class V shall be included every building which is used as a public theater where an admission fee is charged and in which movable scenery is used, and every assembly hall hereafter erected having a seating capacity of over 300 and containing a permanent stage on which scenery and theatrical apparatus are used and regular theatrical vaudeville performances are given; provided, however, that public halls and club halls with a seating capacity of less than six hundred, although occasionally used for theatrical presentation, shall not be considered as public theatres within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stages thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V as herein defined. Such public halls and club halls shall be included in Class IV as defined in this section.

369½ **Must Comply With General and Special Provisions.)** Every building of Class V shall comply with the general provisions of this chapter and shall also comply with the following special provisions:

370. **City Officers Empowered to Enter Buildings.)** The Commissioner of Buildings, Commissioner of Health, Fire Marshal, City Electrician, Superintendent of Police, or any of them, and their respective assistants, shall have the right to enter any building used wholly or in part for the purposes of Class V, and any and all parts thereof, at any reasonable time, and at any time when occupied by the public, in order to examine such buildings, to judge of the condition of the same and to discharge their respective duties, and it shall be unlawful for any person to interfere with them, or any of them, in the performance of their duties.

371. **City Officers Empowered to Close.)** The Commissioner of Buildings, Commissioner of Health, Fire Marshal, City Electrician and the Superintendent of Police, or any one of them, shall have the power, and it shall be their joint and several duty, to order any building used wholly or in part for the purposes of Class V, closed, where it is discovered that there is any violation of any of the provisions of the chapter, and keep same closed until such provisions are complied with.

372. **License — Mayor Shall Revoke.)** Upon a report to the Mayor by the Commissioner of Buildings, Commissioner of Health, Fire Marshal, City Electrician or the Superintendent of Police that any requirement of this chapter or that any order given by them or any of them in regard thereto has been violated, or not complied with, the Mayor shall revoke the license of any such theatre or place of amusement so reported and cause the same to be closed.

Buildings of Class V Now in Existence.

373. **Buildings of Class V Now in Existence.)** The following provisions shall apply to Class V buildings in existence at the time of the passage of this ordinance:

374. **Walls—Outside—Must Comply with Requirements of Section 519.)** The outside walls of all such buildings in existence at the time of the passage of this ordinance, the roofs or ceilings of which are carried on trusses or girders of a span of fifty feet or more shall comply with the requirements of Section 519.

375. **Columns in Walls—Alterations.)** If iron or steel columns are introduced in the walls referred to in Section 374, the brick work around the same shall be bonded into that of the connecting walls, and each of such columns shall be fireproofed as provided in Sections 624 and 625 of this chapter. All alterations in such existing buildings, to make them comply with the requirements of this chapter may be executed with the same kind of materials as those originally used in the construction of such buildings; provided, that after the said building is brought into compliance with the provisions of this chapter, then all subsequent alterations, enlargements, repairs, replaced or strengthened structural parts damaged by fire, wear and tear, or otherwise, shall be made of fireproof construction or iron or steel construction covered with fireproof materials, as provided by this chapter.

376. **Other Classes Built in Conjunction with Class V—Doors for Openings Between Connecting Buildings.)** In all cases where existing buildings used wholly or in part for the purposes of Class V are built in conjunction with or as part of buildings devoted to the uses of other classes and where such buildings of the other classes, as specified in this ordinance, are not built entirely of fireproof construction, double iron doors shall be placed at each connecting opening between such buildings of Class V and the building connected therewith.

377. **Floor Levels—Limitations of.)** (a) Any audience room used for the purposes of Class V containing in the aggregate not more than five hundred seats, if in a fire-

proof building, may be located in any story thereof, but in such case there shall be at least two stairways to the ground, from the floor or floors on which each such room is located, each of which stairways shall be not less than four feet in width in the clear.

(b) In existing buildings of fireproof construction, having an audience room with a seating capacity of more than five hundred and less than fifteen hundred, the lowest bank of seats on the main floor thereof shall be not more than twelve feet above the street level, and every such building shall in all other respects conform to the requirements of this ordinance. The main floor of no existing theatre of any construction other than fireproof shall be raised above its present elevation.

378. **Loads—Allowance for Live Loads in Construction of Floors of Class V.)** For all buildings of Class V all floors shall be designed and constructed in such manner as to be capable of supporting in all their parts, in addition to the weight of floor construction, partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floors.

379. **Stairways—Entrances and Exits.)** (a) Stairways, affording egress from any room or rooms used for the purposes of Class V shall be equivalent in width to twenty inches for every one hundred of seating capacity of such room, and for fractional parts of one hundred a proportionate part of twenty inches shall be added, but no such stairway shall be less than four feet wide in the clear, except as hereinafter provided in this section.

(b) All such stairways shall have hand railings on each side thereof and shall not ascend to a greater height than thirteen feet six inches without a level landing, and the length and width of such landing shall not be less than the width of the stairs. No run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms. Stairways which are over 7 feet wide shall have double intermediate handrails with end newel posts at least 5½ feet high.

(c) Steps shall not have a greater rise than 8 inches, treads shall not be narrower than 10 inches, and winders shall not be used on any staircase, except where circular staircases are expressly permitted.

(d) In existing theatres every balcony and gallery shall have separate and distinct entrance stairways from the sidewalk level, except that in cases where the vestibule or entrance to any such theatre is not more than fifteen inches, or two steps, above the sidewalk level and such steps are at or near the building line, the stairways to such balcony and gallery may ascend from the floor of such vestibule or entrance, but if the run of the stairs at the bottom is not toward the street, there shall be a hand rail or rails, three feet above the floor constructed from the foot of such stairways for a distance of not less than five feet leading toward the street. All doors intervening between such stairways and the street shall, during each and every performance, be kept unfastened.

(e) There shall be an iron stairway or stairways from the stage to the fly galleries and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Such stairways may be circular. Such circular stairways, however, shall not be used for access to the dressing rooms.

(f) Every stairway leading to a box or boxes shall be independent of all other stairs or seats; and such stairway shall not be less than two feet eight inches wide in the clear, when such box or boxes seat not to exceed thirty people, and an additional width of one inch shall be added to such stairway for each additional five persons for whom seating capacity is provided.

(g) Every stairway on the stage side of the proscenium wall shall be not less than two feet six inches wide.

(h) Instead of increasing the width required for entrances, aisles, exits and stairways to that required by this chapter, the owner, lessee or manager of any such theatre shall have the privilege of reducing the number of permanent seats therein until the same ratio between such width and number of seats as hereinbefore provided for shall be established, and if such privilege be taken advantage of, it shall be the duty of the Commissioner of Buildings to make inspection and certify that such ratio actually exists before a license for the operation of any such theatre shall be issued.

380. **Floors and Exits.)** Floors at all exits shall be level and flush with adjacent inside floors and shall extend for an unbroken width of not less than four feet in front of each exit, and shall be two feet wider than such exit.

381. **Seats in Rows Between Aisles.)** (a) Not more than ten seats in any row shall be permitted between aisles in any gallery. On the main floor and balcony not more than eleven seats shall be permitted between aisles; except in rows of seats which are within twenty feet from the exits, in which case thirteen seats shall be permitted between aisles.

(b) Seats shall be not less than twenty inches in width measured at the top of the seat backs. Rows of seats shall be not less than two feet eight inches from back to back.

No bank of seats shall be of greater rise than twenty-two inches.

(c) All groups of seats shall be so arranged that there shall be an aisle at each side of each group, except that groups of five seats or less may abut upon a tunnel at one side and an aisle at the other. And except that a bank of seats abutting boxes or walls on main floor, balcony, and gallery, of not over five seats in a row, shall be required to abut upon one aisle only.

(d) The number of banks of seats on the main floor shall not exceed fifteen unless an intervening or cross aisle is provided between each fifteen banks of seats or unless a direct exit is provided for each aisle.

(e) The number of banks of seats in the balcony shall not exceed nine unless an intervening or cross aisle is provided between each nine banks of seats or unless a direct exit be provided for each aisle.

382. **Tunnels—Cross Aisles—Vertical Rise—Foyer.)** (a) There shall be no more than twelve-feet rise measured vertically in any aisle in any gallery without a direct exit by tunnel or otherwise to a corridor with free opening on to the gallery stairs or other direct discharge to the street, or at such elevation of twelve feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than three feet wide in the clear.

(b) No foyer shall be open to the theatre proper except through the exits.

383. **Main Floor—Balcony and Gallery—Designation of.)** (a) The lower floor of all theatres shall be designated the "Main Floor."

(b) Where there are balconies or galleries, the first balcony or gallery shall be designated the "Balcony," and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery."

384. **Aisles, Corridors and Passageways—Kept Unobstructed—Steps in Aisles.)** (a)

The minimum width of aisles with diverging sides in any room used for the purposes of Class V shall be two feet eight inches at the end near the stage and not less than three feet at the other end.

(b) The minimum width of aisles with parallel sides shall be three feet.

(c) Every aisle shall lead as nearly as possible directly to an exit, but in no case shall the center line of such exit be more than three feet from the center line of any such aisle leading thereto.

(d) Steps shall not be permitted in aisles except as extending from bank to bank of seats, and no riser shall be greater than 8 inches, and no tread shall be less than 10 inches, and whenever the rise from bank to bank of seats is less than five inches, the floor of the aisles shall be made as an inclined plane, and where steps are placed in outside aisles or corridors they shall not be isolated, but shall be grouped together and a light shall be maintained so that every place where there are steps in inclosing aisles or corridors shall be clearly lighted.

(e) All aisles passageways, corridors and exits shall be kept free from camp stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any of such aisles, passageways, corridors or exits during any performance, service, exhibition, lecture, concert or any public assemblage.

385. **Corridors, Passageways, Hallways and Doors—Width of.)** (a) The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, excepting, however, that no corridor shall be anywhere less than four feet in width, and no door less than three feet wide, except as otherwise herein provided.

(b) All corridors, passageways, hallways and stairways leading from any balcony or gallery to any toilet room, retiring room, smoking room, check room or private office, shall lead directly to an outer exit of the building. Such corridors, passageways, hallways and stairways shall be at least three feet in width in every part, and shall be unobstructed in every part except by doors, not less than three feet in width in the clear, which shall swing outward and which shall not have locks or catches of any kind whatever.

386. **Doors—Entrance.)** (a) The width of entrance doors to every theatre shall be computed on the basis of twenty inches in the clear to each one hundred permanent seats in the audience room and in addition thereto a proportionate part of twenty inches for the fractional part of one hundred seats shall be added.

(b) No mirror or architectural feature shall be so arranged as to give the appearance of a doorway, exit, hallway or corridor where none exists.

387. **Dressing Room Partitions.)** Partitions forming dressing rooms, except where already built, shall be constructed of incombustible material, and such dressing rooms shall be properly ventilated.

388. **Emergency Exits—Width—Emergency Stairs—Width—Emergency Exits Inside Walls of Buildings—Fire Escapes, Construction—Fire Escapes Leading to Street or Alley—Doors Open Outward.)** (a) Emergency exits and stairways shall be provided separately for each door, balcony and gallery and shall be of the same aggregate width as that provided for the main exits, and shall not be less than three feet in width. Such emergency exits shall be kept free of obstructions of every kind, including snow and ice.

(b) Such emergency exits and stairways may be built inside the walls of the building, provided they are enclosed by a fireproof partition not less than four inches thick separating the exits and stairways from the audience room or auditorium.

(c) If said emergency exits lead outside the building, the opening leading thereto shall have metal doors with wired glass panels. The doors shall open outward, and shall be hung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of the wall. Outside shutters will not be permitted, except when they open automatically from the interior, without resistance, and when used or open will automatically fasten, securely, flat against the wall, so as not to obstruct the passage on the outside; all such automatic devices or attachments to said doors or shutters shall be subject to the approval of the Commissioner of Buildings and the Fire Marshal of the City of Chicago.

(d) Whenever any such emergency stairway passes over an exit door, window or other opening, such stairway shall be completely inclosed for a space of five feet greater in width than such opening, by iron, steel or other incombustible material.

(e) All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any doors, gates, bars or obstruction of any character.

(f) Every court in which there is an emergency stairway shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley, or street, without entering into or passing through or over any building unless by a fireproof passage at least four feet wide and seven feet high on the court or ground level.

(g) All doors in openings from any and all exits and stairways shall be so constructed that when opened they shall not obstruct any portion of any other doorway, opening or passageway.

(h) All doors affording ingress to or egress from any theatre shall open outward and such doors shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

389. **Wall—Brick Proscenium Wall Between Auditorium and Stage—Steel Curtain Fireproofed on Stage Side—No Combustible Material on Audience Side—Plans for Curtains—Permit from Building Department—Inspection Fee.)** (a) There shall be in every theatre a solid brick wall of the same construction and thickness as is required in outside walls between the auditorium and the stage. The main proscenium opening shall have a substantial steel curtain vertically operated and fireproofed on the stage side, which shall be raised and lowered by mechanical power and shall be in constant use as the regular curtain and act drop. In vaudeville houses said curtain shall be lowered at least once during each performance.

(b) No combustible material other than painted decorations shall be applied to the audience side of such curtains.

(c) Plans for such curtains shall be approved by the Commissioner of Buildings and a permit obtained previous to its erection. The Commissioner of Buildings shall inspect such curtain semi-annually, for which inspection a fee of five dollars shall be charged.

(d) All other openings in such proscenium wall shall have iron doors, frames and thresholds.

390. **Stage—Construction of—Fireproof Paint—Scenery—How Treated.)** (a) The

framing of the floor of every stage shall be of iron or steel. The stage floor may be of wood not less than one and three-fourths inches thick, and the under side of stage floor shall be saturated with a fireproof solution satisfactory to the Fire Marshal. The entire floor construction and floor of fly galleries, rigging lofts and paint gallery, all railings and supports and stanchions thereon, and all sheaves, pulleys and cables, and their supports, shall be of iron or steel. All woodwork and all framing for scenery used on or about the stage shall also be saturated with a fireproof solution, the same as prescribed for stage flooring.

(b) Counter weighting of scenery must be done with incombustible weights carried on steel cables and operated in grooves or slotted channels; except that small sandbags, weighing not over eight pounds, may be used to bring down scenery ropes to stage level.

(c) No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for theatrical purposes, unless such scenery and paraphernalia shall have been treated with a fireproof or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

391. **Vestibule for Stage Doors.)** All doorways and openings in the rear or sides of the stage shall be vestibuled or arranged in a manner satisfactory to the Commissioner of Buildings so as to protect the curtain, scenery and auditorium against draughts of air.

392. **Vents—Flue Pipes, Size of—Dampers—Switches for Dampers.)** (a) One or more vents, or flue pipes, of metal construction or other incombustible material, suitable for carrying away smoke, approved by the Commissioner of Buildings, and extending not less than fifteen feet above the highest point of the roof and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.

(b) In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point of such additional stories.

(c) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches or either of them, fail to operate. Such stations shall be located in such places on the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.

(d) All fuse boxes shall be surrounded by two thicknesses of fireproof material, with an air space between, and no fuses shall be exposed to the air between the switch board.

393. **Automatic Sprinklers—Location of—Tank—Connections.)** (a) An approved system of automatic sprinklers shall be provided in every theatre of this class, with approved automatic closed circuit electric devices, connecting the valves regulating the flow of water in the various sprinkler pipes, with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal shall direct, so arranged as to prevent any tampering with the system or the shutting off of the water from the sprinkler pipes, without automatic notice to the Fire Department.

(b) Such system of automatic sprinklers shall be supplied with water from a tank located not less than twenty feet above the level of the highest sprinkler head in the system, and it shall be the duty of the fireman provided for in this ordinance to include in his daily report the result of an inspection to determine the sufficiency of water in this tank. Automatic sprinklers shall be placed in the paint room, store room, property room, scene-storage room, carpenter shop and dressing rooms. If such rooms are in or connected with a building used for the purposes of Class V, such tank shall not be connected with a standpipe and ladder system, but shall be filled through a separate pipe from a fire pump, and a three-inch iron pipe shall extend from such tank to the outside of such building, with Siamese connections, for fire department use. Such entire automatic sprinkler system and equipment and the location thereof shall be subject to the approval of the Fire Marshal.

394. **Fire Apparatus on Stage—Hand Fire Pumps—Fire Apparatus.)** (a) A standpipe not less than two and a half inches in diameter, having a hose valve or valves thereon, shall be installed on each side of the stage, with a hose connection at the stage and at each floor above and below the stage. Such standpipes shall be connected with a frost protected tank on the roof, containing not less than 3,000 gallons of water, and also with a power pump. A length of approved one and one-half inch unlined linen hose, with five-eighths inch smooth bore nozzle, shall be attached to each outlet. Hose, when not in use, shall be mounted on self-releasing racks of approved pattern. Approved portable fire extinguishers or hand fire pumps, shall always be kept ready for use on and under the stage, in fly galleries and in rigging lofts, and, in addition thereto, at least four fire department axes and six pike poles shall be kept ready for use on each tier or floor of the stage.

(b) In all existing non-fireproof theatres, excepting such as are already equipped with a two and one-half-inch standpipe in the auditorium portion, there shall be one three-inch standpipe in the auditorium portion, supplied as follows: (1st) By a frost-protected gravity tank of not less than 5,000-gallon capacity, the bottom of which shall be elevated at least twenty-five feet above the highest hose outlet; (2nd) A centrifugal power pump with hand control, having a capacity of not less than 300 gallons per minute against 50 pounds pressure at the stage roof line, except that where an automatic pump is installed in compliance with the provisions of this chapter, such pump may be used as one source of supply for standpipes; (3rd) In addition to the above, there shall be a pipe of not less than three-inch diameter, connected to the standpipe and extending to the outside of the building with a Siamese steamer connection, properly placarded and suitable for fire department use. Gravity tank shall be filled through a one and one-half-inch connection from pump. All necessary gages, swing checks and gate valves shall be provided. Such standpipe shall have a one and one-half-inch hose outlet on the main floor, balcony and galleries. Each outlet shall be provided with a straightway hose gate valve and dripcock connection for the purpose of keeping leakage out of the hose.

(c) All of the above mentioned equipment shall be installed and maintained under the direction of and subject to the approval of the Fire Marshal.

(d) The use of ordinary hot-air furnaces or stoves is prohibited.

395. **Lighting—Independent Lighting System for Exits—Red Lights Over Exits.)** (a) All stairways and corridors shall be supplied with a supplementary lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building and shall be in operation during the entire period such theatre is open to the public and until the audience has left the building. The word "EXIT" shall appear in letters at least six inches high over the opening to every means of egress from such theatre and a red light furnished by gas or sperm oil shall be provided over such sign.

(b) In every theatre, every portion thereof devoted to the use or accommodation of the public, and all outlets therefrom leading to the streets, including open courts, corridors, stairways, exits and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such rooms and spaces, and every passageway, court, corridor, stairway, exit and emergency stairway shall be provided with signs indicating the way out of the building, the letters of which shall not be less than six inches in height.

396. **Lights—Control of Lights in Halls, Corridors and Lobbies—Separate Shut-off—Connections with Gas Mains—Independent Connections—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights—Ducts and Shafts Conducting Heated Air from Lights—Gas Stage Lights to Have Metal Screens.)** Gas and electric lights in the halls, corridors, lobbies or any other part of any theatre used by the audience, except the auditorium, shall be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place. Gas mains supplying such theatre shall have independent connections for the auditorium and the stage, and provisions shall be made for shutting off the gas from the outside of the building. Suspended or bracket lights surrounded by glass in the auditorium, or in any other part of the theatre, shall be provided with proper wire netting underneath. No gas or electric lights shall be inserted in the walls, woodwork, ceilings, or in any part of the theatre, unless protected by fireproof materials. Border lights shall be constructed according to the best known method and subject to the approval of the Fire Marshal and the City Electrician, and shall be suspended by wire rope. Ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between. Gas stage lights shall have strong metal wire guards or screens not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flames of such lights, and shall be soldered to the fixtures in all cases.

397. **Fire Apparatus—Under Control of Fire Department.)** The standpipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtain, switch boxes, ventilators, controlling levers, axes and pike poles, and all apparatus for the extinguishing of fire or guarding against the same, as provided for by this ordinance, shall be made and kept at all times in condition satisfactory to and under the control of the Fire Marshal.

398. **Fire Alarm Apparatus.)** Every theatre shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus connected by the necessary wires with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal may direct. The number and location of the boxes and the character of the system, whether automatic or manual, or both, shall be determined by the Fire Marshal.

399. **Capacity—Certification for License.)** The Commissioner of Buildings shall determine the number of persons which every room used for the purposes of Class V may accommodate according to the provisions of this chapter and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.

400. **Theatres in Frame Buildings Prohibited.)** On and after June 1st, 1911, no frame building or part thereof within the city shall be used as a moving picture, vaudeville or other theatre.

To Buildings of Class V Hereafter Erected.

The following provisions shall apply to buildings of Class V hereafter erected and used wholly or in part for such purposes:

401. **Construction—Walls—Outside Walls—Structures.)** All buildings of Class V hereafter erected shall be built of fireproof construction.

402. **Frontage—Open Spaces—Fireproof Passageways.)** (a) All buildings hereafter erected used wholly or in part for the purposes of Class V shall be located so that they adjoin at least two public thoroughfares, one of which shall be a public street and the other may be a public alley not less than ten (10) feet in width.

(b) The audience room of every such building used for the purposes of Class V shall have either a public thoroughfare or an open space not less than ten feet wide extending from the lowest first floor level to the sky, on each of the two sides other than the proscenium and the foyer. Exit doors shall open onto such public thoroughfare or the bottom of such open space from the respective sides of the stage and of the main floor of the audience room, and onto balconies or platforms built in such public thoroughfare or open space at both the highest and the lowest floor levels of each and every balcony and gallery and the doors opening into such public thoroughfare or open space from any balcony or gallery or from the main floor shall comply with all the requirements prescribed in Section 410 of this chapter.

(c) All such balconies or platforms shall be connected with stairway fire escapes leading to the street level or to the bottom of such open space and in the latter case they shall have their bottom run toward the public thoroughfare and such balconies or platforms and such fire escapes shall comply with all the requirements prescribed in Sections 669, 670 and 673 of this chapter. Every such open space, if it does not open into a public thoroughfare shall communicate with the public thoroughfare at the front side of the theatre by a fireproof passageway leading from the bottom level of such open space to the sidewalk level. Where there is a public thoroughfare behind the stage every such open space shall also communicate with such public thoroughfare by a fireproof passageway leading from the bottom level of such open space to the level of the public thoroughfare behind the stage, and passing under the stage.

(d) The walls of a fireproof passageway shall be not less than four inches thick, and each and every part of such passageway, including each and all of its supports, shall be built of fireproof construction as required in the general provisions of this chapter relating thereto.

(e) Radiators for warming passageways shall be in recesses sufficient in depth to prevent them from obstructing the passageway.

(f) There shall be no steps or risers in fireproof passageways, but where necessary, inclined floors of the full width of the fireproof passageway may be built; the incline of the floor shall not exceed two and one-half inches in height per foot measured horizontally, and no such incline shall be less than ten feet in length. No fireproof passageway shall be less than ten feet wide and eight feet high in any part thereof except at doors, and these door openings shall be not less than eight feet wide and seven feet high.

(g) If the principal entrance corridor of a theatre is at one side and approximately at right angles to the central axis of the audience room, then the center line extended of such principal entrance shall intersect the center axis of the stage and the audience room between the back of the seat most remote from the stage, on said center axis of the stage and the audience room and at a point midway between such seat and the wall opposite the proscenium wall.

403. **Buildings of Other Classes Built in Conjunction with Class V.)** If buildings used wholly or in part for purposes of Class V, are built in conjunction with or as part of buildings devoted to the uses of other classes, then such buildings of other classes shall be built of fireproof construction.

404. **Floor Levels—Limitations of.)** (a) The floor level of the highest bank of seats on the main floor shall not be more than three feet above the sidewalk level and the floor level of the lowest bank of seats on said floor shall not be more than eight feet below the sidewalk level.

(b) All floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, permanent fixtures and mechanisms that may set upon the same, a live load of one hundred pounds for every square foot of surface in such floors.

(c) The audience room or rooms or auditorium or auditoriums used for the purposes of Class V containing, in the aggregate, not more than five hundred seats, if in a fireproof building, may be located in any story thereof, but in such case there shall be at least two separate stairways from the floor or floors in which such audience room or auditorium is located to the ground, each of which stairways shall be not less than four feet in width in the clear.

405. **Stairways—Entrances and Exits.)** (a) Stairways affording ingress to or egress from any room used for the purposes of Class V shall be in width equivalent to twenty inches for each one hundred of seating capacity of such room, and for fractional parts of one hundred a proportionate part of twenty inches of width shall be added, but in no event shall any such stairways be less than four feet in the clear, except as hereinafter provided.

(b) All such stairways shall have hand rails on each side thereof, and shall not ascend to a greater height than thirteen feet six inches without a level landing, and the length and width of such landing shall be not less than the width of the stairs; no run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms. Stairways which are over seven feet wide shall have double intermediate hand rails with end newel posts at least five and one-half feet high.

(c) Steps shall not have a greater rise than eight inches, treads shall not be narrower than eleven inches, and winders shall not be used on any staircase.

(d) Every balcony and gallery shall have one or more separate and distinct exits and stairways to the sidewalk level. All gallery stairways shall lead to the top gallery and there shall be doors in same at each floor for exit purposes only. The bottom run of the stairs shall be directly toward the street. Such stairs may ascend from the vestibule or entrance inside of the buildings, but the bottom riser of such stairs shall be not more than sixty-five feet from the building line. All doors between such stairs and the street shall be kept unlocked and unfastened during each and every performance and until the audience has left the building.

(e) There shall be an iron stairway or stairways from the stage to the fly gallery and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Such stairway may be circular. Such circular stairways, however, shall not be used for access to the dressing rooms.

(f) Stairs leading to a box or boxes seating not to exceed thirty people in the aggregate shall be independent of all other stairs and seats, and not less than two feet eight inches wide in the clear. For each additional twenty-five persons for whom seating capacity is provided, or major portion thereof, in such box or boxes there shall be an additional five inches in width of such stairway.

(g) All stairways on the stage side of the proscenium wall shall be not less than two feet six inches wide.

406. **Floors at Exits — Seating.)** (a) Floors at all exits shall be level and flush with adjacent inside floors and shall extend for an unbroken width of not less than four feet in front of each exit, and shall be two feet wider than such exit.

(b) There shall not be more than ten seats in any one row between aisles.

(c) Seats shall not be less than twenty-two inches in width, measured at the top of the seat backs.

(d) Rows of seats shall not be less than two feet ten inches from back to back.

(e) No bank of seats shall have a greater rise than twenty inches. A bank of seats abutting boxes or wall on main floor, balcony or gallery of not over five seats in a row, shall be required to abut upon one aisle only.

(f) Seats in loges and boxes shall be limited in the ratio of one seat for every six hundred and eighty square inches of floor area in such loge or box.

(g) All groups of seats shall be so arranged that there shall be an aisle at each side of each group, provided groups of five seats or less may abut upon a tunnel at one side and an aisle on the other side.

(h) The number of banks of seats on the main floor shall not exceed fifteen, unless an intervening or cross aisle is provided between each fifteen banks of seats or a direct exit is provided for each aisle. The number of banks of seats in the "balcony" and "galleries" shall not exceed nine, unless an intervening or cross aisle is provided between each nine banks of seats or a direct exit is provided for each aisle.

407. **Tunnels—Cross Aisles—Vertical Rise —Foyer.)** (a) There shall be no more than eleven feet rise, measured vertically, in any aisle in any gallery without a direct exit by tunnel or otherwise, to a corridor with free opening onto the gallery stairs or other direct discharge to the street or at any such elevation of eleven feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than four feet wide in the clear.

(b) No foyer shall be open to the theater proper except through the exits.

408. **Main Floor Balcony and Gallery—Designation of.)** (a) The lower floor shall be designated the "Main Floor."

(b) Where there are balconies or galleries, the first balcony or gallery shall be designated the "Balcony" and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery."

409. **Aisles and Passageways—Steps in Aisles.)** (a) The minimum width of aisles with divergent sides in any room used for the purpose of Class V shall be two feet eight inches at the end nearest the stage and not less than three feet at the other end. The minimum width of aisles with parallel sides shall be three feet.

(b) Every aisle shall lead directly to an exit. Any exit located at the end of any aisle and at right angles thereto shall be considered a direct exit.

(c) Steps shall not be permitted in aisles except as extending from bank to bank of seats, and no riser shall be more than eight inches in height, and no tread shall be less than ten inches in width, and whenever the rise from bank to bank of seats is less than five inches, the floor of the aisle shall be made as an inclined plane, and where steps are placed in outside aisles or corridors they shall not be inclosed but shall be grouped together, and a light shall be maintained so that every place where there are steps in inclosing aisles or corridors shall be clearly lighted.

410. **Corridors—Passageways—Hallways and Doors—Width of.** (a) The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, excepting however, that no corridors shall be less than five feet in width and no doorway less than three feet wide, except as otherwise herein provided.

(b) All corridors, passageways, hallways and stairways leading from any balcony or gallery to any toilet room, retiring room, smoking room, cloak room, check room, or private office, shall permit of free passage, without returning, to an outer exit of the building. Such corridors, passageways, hallways and stairways shall be at least four feet in width in every part between such balcony or gallery and such outer exit, and shall be unobstructed in every part, except by doors not less than three feet in width in the clear, which shall swing outward and which shall not be provided with locks or catches of any kind whatever.

(c) The width of entrance doors to every theatre shall be computed on the basis of twenty inches in the clear to each 100 permanent seats in the audience room, and in addition thereto a proportionate part of twenty inches for the fractional part of 100 seats remaining shall be added.

(d) No mirror or architectural feature shall be so arranged as to give the appearance of a doorway, window, exit, hallway or corridor where none exists.

411. **Emergency Exits—Width—Emergency Stairs, Width—Emergency Exits Inside Walls of Buildings—Fire Escapes, Construction—Fire Escapes Leading to Street or Alley—Doors Open Outward.)** (a) Emergency exits and stairways shall be provided separately for each floor, balcony or gallery and shall be of the same aggregate width as that provided for the main exits, and shall not be less than three feet in width. Such emergency stairway shall be made of iron, steel or other incombustible material. Such emergency exit shall be kept free of obstructions of every kind, including snow and ice.

(b) Such emergency exits and stairways may be built inside the walls of the building, provided they are enclosed by a fireproof partition not less than four inches thick, separating the exits and stairways from the audience room or auditorium.

(c) If such emergency exits lead outside the building, the openings leading thereto shall have metal doors with wired glass panels. The doors shall open outward, and shall be hung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of the wall, and outer shutters shall not be permitted.

(d) Whenever any such emergency stairway passes over an exit, door, window or other opening, such stairway shall be completely inclosed for a space of five feet greater in width than such opening, by iron, steel or other incombustible material.

(e) All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any door, gate, bars or obstruction of any character.

(f) Every court in which there is an emergency stairway shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley or street without entering into or passing through or over any building unless by a four-foot wide fireproof passage on the court or ground level.

(g) All doors in openings from emergency exits and stairways shall be so constructed that when opened they will not obstruct any portion of any other doorway, opening or passageway.

(h) All doors affording ingress to or egress from any theatre shall open outward and shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

412. **Wall—Brick Proscenium Between Auditorium and Stage—Steel Curtain Fireproofed on Stage Side—No Combustible Material on Audience Side—Plans for Curtain—Permit from Building Department.)** (a) There shall be a solid masonry wall of the same construction and thickness as is required in the outside walls of the building in which such theatre is located between the auditorium and the stage.

(b) The main proscenium opening shall have a vertically operated steel curtain which shall, when it is lowered, completely close such proscenium opening. The curtain shall be raised and lowered by hydraulic power, and shall be in constant use as the regular curtain and act drop. In vaudeville houses said curtain shall be lowered at least once during the performances.

(c) The lowering of the curtain shall be controlled from not less than two points in the building, one of which shall be from the stage level and the other shall be designated by the Commissioner of Buildings.

(d) The curtain shall have a steel covering on the outer or auditorium side. The stage side covering shall be of a non-heat-conducting substance of such a thickness and such material as shall stand a test of two thousand degrees Fahrenheit on the stage side for fifteen minutes without heating the opposite side to a higher temperature than three hundred and fifty degrees Fahrenheit.

(e) All metal work with the exception of the frame shall be covered with such non-heat-conducting substances on the stage side.

(f) The curtain shall operate vertically in steel guides of such a cross section that the edges shall engage and secure the edges of the curtain and prevent the curtain from leaving the guiding channel or channels if the curtain should tend to buckle or bag either inward or outward. No metal in the guide channel or in the engaging edge of

the curtain shall be less than three-eighths of an inch thick. The joints of the curtain with the proscenium wall, with the stage floor and with the head of the opening shall be made gas tight as nearly as practicable.

(g) The calculations for the strength of the curtain, the curtain guides and the guide anchors, and the workmanship, shall be according to the best modern engineering practice. The stresses in the material and in the various sections of steel shall be within the safe limits of stress described in this ordinance.

(h) No part of a curtain or of the curtain guides shall be supported by or fastened by any combustible material.

(i) The supports of the curtain and the curtain guides and edges and the curtain shall be of sufficient strength to safely resist either inward or outward a pressure of five pounds for each and every square foot of the curtain.

(j) No combustible material other than painted decorations shall be applied to the audience side of any such curtain.

(k) Plans for every such curtain shall be approved by the Commissioner of Buildings and a permit obtained therefor previous to its erection. The Commissioner of Buildings shall inspect such curtain semi-annually, and for each such inspection a fee of five dollars shall be charged.

(l) Every other opening in such proscenium wall shall have self-closing regulation standard iron fire doors and iron frames and thresholds; such doors and frames shall be built in such a manner as to resist warping.

413. **Stage, Construction of—Fireproof Paint—Scenery—How Treated.)** (a) The framing of the floor of every stage shall be of iron or steel or fireproof material. The stage floor may be of wood not less than two and three-fourths inches thick. The entire floor construction and fly galleries, rigging lofts and paint galleries, all stairways and supports and stanchions therein and all sheaves, pulleys, cables and other supports shall be of iron or steel. The woodwork of the stage floor shall be saturated with a fireproof solution satisfactory to the Fire Marshal. All other woodwork and all framing for scenery on or about the stage shall be coated with fireproof paint, which shall be submitted to and approved by the Fire Marshal. All wood used for the floor supports shall be saturated with a fireproof solution satisfactory to the Fire Marshal.

(b) Counter weighting of scenery must be done with incombustible weights carried on steel cables and operated in grooves or slotted channels; except that small sand bags weighing not over eight pounds may be used to bring scenery ropes down to stage level.

(c) No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of Class V unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal. All draperies in the auditorium, including the drop curtains, must be fireproofed at least once a year, subject to the approval of the Fire Marshal.

414. **Vestibules for Stage Doors.)** All doorways and openings in the rear or sides of the stage shall be vestibuled or arranged in a manner satisfactory to the Commissioner of Buildings, so as to protect the curtain, scenery and auditorium against draughts of air.

415. **Structures Over Ceiling—Construction.)** If any structure is built over the ceiling or roof of any theater, the different members of the girders or trusses supporting same shall be fireproofed in the manner prescribed for columns of fireproof buildings as specified in the General Provisions of this chapter.

416. **Vents—Size of—Flue Pipes—Dampers—Switches for Dampers.)** (a) One or more vents or flue pipes of metal construction, or other incombustible material, suitable for carrying away smoke, and approved by the Commissioner of Buildings, and extending not less than fifteen feet above the highest point of the roof, and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.

(b) In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point of such additional story.

(c) All such flues or vents shall be provided with metal dampers which shall be controlled or operated by a small tarred hempen cord and also by two electric switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the stage fireman's station on the opposite side of the stage; the arrangement of said cord and said electric switches shall be such that the cord will operate as a fusible link between the electric control and the damper and will release said damper, should the switches or either of them, fail to operate. Such stations shall be located in such places on the stage as may be determined by the Fire Marshal, subject to the provisions of this paragraph, and each switch shall have a sign with plain directions as to the operation of the same printed thereon.

(d) All fuse boxes shall be surrounded by two thicknesses of fireproof materials, with an air space between, and no fuses shall be exposed to the air between the switchboards.

417. **Automatic Sprinkler — Location — Tank—Connections.)** (a) An approved system of automatic sprinklers shall be provided in theatres of this class, which shall comply with the following requirements: (1st) Said sprinkler heads shall be placed in the paint room, store room, property room, scene storage room, carpenter shop, and dressing rooms and spaced according to the best fire protection practice; (2nd) Said system shall be supplied by a frost-protected gravity tank of not less than 5,000 gallons capacity located above stage roof and bottom of tank shall be not less than twenty-five feet above the highest sprinkler head, or by an automatic centrifugal pump of not less than 500 gallons capacity per minute against 100 pounds pressure at the pump; (3rd) Said gravity tank, if used, shall be entirely independent of any standpipe system, unless the tank is of sufficient capacity to supply both systems and unless the supply pipe to standpipe is so arranged that it can not reduce the sprinkler system supply; (4th) Said gravity tank, if used, shall be filled through a supply pipe at least one and one-half inches in diameter from fire pump hereinafter provided for in this chapter; (5th) There shall be a pipe of not less than three-inch diameter connected to the sprinkler system and extending to the outside of the building with a Siamese steamer connection properly placarded and suitable for Fire Department use; (6th) There shall be an approved system of local alarms with a bell in the ticket office, a buzzer in the lobby and on the stage and a bell and annunciator in the basement or in the boiler or engine room; all necessary gauges, including altitude gauge for tank riser, shall be located on main floor. Swing checks and gates shall be provided.

(b) The entire sprinkler system and equipment and the location, installations and maintenance thereof, shall be subject to the approval of the Fire Marshal.

418. **Fire Apparatus on Stage—Hand Fire Pumps—Fire Apparatus.)** There shall be installed on each side of the stage a standpipe of not less than three inches in diameter with a hose connection at the stage floor and at each floor level above and below the stage, which standpipe shall be supplied by a frost-protected gravity tank of a capacity of not less than 5,000 gallons. The bottom of said gravity tank shall be elevated at least twenty-five feet above the highest hose outlet and said gravity tank shall be equipped with a centrifugal power pump with hand controller, which power pump shall have a pumping capacity of not less than three hundred gallons per minute against fifty pounds pressure at the stage roof, except in cases where an automatic pump is installed which shall comply with the provisions of Section 417 of this chapter, in which event such pump may be used as a source of supply for standpipes. In addition to the above requirements of this Section there shall be a pipe of not less than three inches in diameter connected to the standpipes and extending to the outside of the building and equipped with a Siamese steamer connection properly placarded for and suitable for fire department use. All gravity tanks shall be filled through not less than one and one-half inch connection from pump and shall be provided with gauges, swing checks and gate valves. Each standpipe shall have one and one-half-inch hose outlet above, below and on the stage. Such outlet shall be provided with a straightway hose and a valve and drop cock connection. A length of approved one and one-half-inch unlined linen hose shall be attached to each outlet, which said linen hose shall have a five-eighths of an inch smooth bore nozzle. All hose shall be mounted on self-releasing racks when not in use. The entire equipment shall be installed under the direction of and subject to the approval of the Fire Marshal. Portable fire extinguishers or hand fire pumps shall be kept ready for use on and under the stage and in the flies, galleries and rigging loft. There shall be kept for use in every theatre of this class at least four fire department axes and six pike poles on each tier or floor of the stage, all of which shall be subject to the approval of the Fire Marshal.

419. **Hot Air Furnaces.)** The use of ordinary hot air furnaces or stoves in all theatres of Class V is prohibited.

420. **Independent Lighting System for Exits—Red Light Over Exits.)** All stairways and corridors shall be supplied with a supplementary lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building. The word "EXIT" shall appear in letters at least six inches high over the opening to every means of egress from such theatre and a red light furnished by gas or sperm oil, shall be provided over such sign.

421. **Fire Alarm Apparatus.)** Every theatre shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus, connected by the necessary wires with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal shall direct. The number and location of the boxes and the character of the system, whether automatic or manual, or both, shall be determined by the Fire Marshal.

422. **Dressing Room Partitions.)** Partitions forming dressing rooms shall be constructed of incombustible material, and such dressing rooms shall be properly ventilated.

423. **Capacity—Certificate for License.)** (a) The Commissioner of Buildings shall determine the number of persons which each room used for the purpose of Class V may accommodate according to the provisions of this chapter, and shall certify the same to the City Clerk. No more than the number so certified shall be allowed in such room at any one time.

(b) No license for the operation of a theatre shall be issued unless the Commissioner of Buildings, Fire Marshal and City Electrician shall first have certified in writing that such theatre complies with the provisions of this chapter in every respect.

424. **Lighting Equipment.)** Every room used for the purposes of Class V, and all outlets therefrom leading to the streets, including passageways, courts, corridors, stairways, exits, and emergency stairways, shall have gas or electric lighting equipment to properly illuminate such room and spaces, and every passageway, court, corridor, stairway, exit, and emergency stairway, shall be provided with signs, indicating the way out of the building, the letters of which shall not be less than six inches in height.

425. **Lights—Control of Lights in Halls, Corridors and Lobbies—Separate Shutoff—Connections with Gas Mains—Independent Connections—Protection of Suspended and Bracket Lights—Protection of Lights Inserted in Walls—Protection of Footlights—Construction of Border Lights—Ducts and Shafts Conducting Heated Air from Lights—Gas Stage Lights to Have Metal Screens.)** Gas and electric lights in the halls, corridors, lobbies or any other part of any theatre used by the audience, except the auditorium, shall be controlled by a separate shutoff located in the lobby and controlled only in that particular place. Gas mains supplying such theatre shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the outside of the building. Suspended or bracket lights surrounded by glass in the auditorium, or in any other part of the theatre shall be provided with proper wire netting underneath. No gas or electric lights shall be inserted in the walls, woodwork, ceiling, or in any part of the theatre unless protected by fireproof materials. The trough containing footlights shall be formed of and surrounded by fireproof material. Border lights shall be constructed according to the best known methods, and subject to the approval of the Fire Marshal and the City Electrician, and shall be suspended by wire ropes. Ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between. Gas stage lights shall have strong wire metal guards or screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flames of such lights, and shall be soldered to the fixtures in all cases.

426. **Fire Apparatus to Be Under Control of Fire Department.)** The standpipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtains, switch boxes, ventilators, controlling levers, axes and pike poles, and all apparatus for the extinguishing of fire or guarding against same, as provided for by this ordinance, shall be made and kept at all times in condition satisfactory to and under control of the Fire Marshal.

427. **Scenery—Definition—Movable Scenery.)** (a) "Scenery" as used in this chapter shall include all scenery, drop curtains, borders and wings which are constructed or made of cloth, canvas or combustible material, whether stationary or movable.

(b) "Movable Scenery" shall include all scenery, drop curtains, borders, and wings which are made movable for the purpose of changing an entire set of scenery and substituting another set during or between the various stage acts.

428. **Communication Between Box Office, Stage and Fly Galleries.)** A system of telephonic communication, subject to the approval of the Commissioner of Buildings and the City Electrician shall be installed between the box office, both sides of the stage, fly galleries, gridiron and space beneath the stage.

429. **Changing from Class IV to Class V.)** Whenever an existing Class IV theatre is changed into a Class V theatre, the same shall be made to comply with all of the provisions for Class V theatres hereafter erected.

ARTICLE IX.

Class VI.

430. **Class VI Defined.)** In Class VI shall be included every tenement and apartment house or building or portion thereof, which is used or intended to be used as a home or residence for two or more families living in separate apartments.

431. **Requirements—General.)** Every building of Class VI shall comply with the provisions of this chapter, and in addition to the general provisions shall comply with the following special provisions:

432. **Definition of "New Tenement House" —"Apartment"—"Yard"—"Court" —"Shaft" "Public Hall"—"Stair Hall"—"Basement" —"Cellar"—"Story"—"Solid Masonry".)** (a) "New tenement house" shall include every tenement, flat and apartment house hereafter erected and every tenement house which shall be increased or diminished in size or otherwise altered after its erection and every building now or hereafter in existence not now used as a tenement house but hereafter converted or altered to such use.

(b) "Apartment" is a room or suite of two or more rooms occupied or intended or designed to be occupied as a family domicile.

(c) "Yard" is an open unoccupied space on the same lot with a tenement house, separating every part of every building on the lot from the rear line of the lot.

(d) "Court" is an open, unoccupied, unobstructed space, other than a yard, on the same lot with a tenement house; a court entirely surrounded by a tenement house is an "inner court"; a court bounded on one side and both ends by a tenement house, and on the remaining side by a lot line is a "lot line court"; a court extending to a street, alley or yard is an "outer court."

(e) "Shaft" includes exterior and interior shafts, whether for air, light, elevator, dumb waiter or any other purpose; a "vent shaft" is one used solely to ventilate or light a water closet compartment, bath room, or pantry.

(f) "Public Hall" is a hall, corridor or passageway not within an apartment.

(g) "Stair Hall" includes the stairs, stair landings and those portions of the public halls through which it is necessary to pass in getting from the entrance floor to the top story.

(h) "Basement" is a story partly, but not more than one-half below the level of the street grade nearest the building.

(i) "Cellar" is a story more than one-half below the level of the street grade nearest the building. Where the grade of a street adjacent to a tenement house varies, the mean or average grade of such street opposite the lot containing the tenement house shall be regarded as the grade of such street within the meaning of this chapter.

(j) "Story" is that portion of a building between the top of any floor beams and the top of the floor or ceiling beams next above.

433. **Sections—Where Conflicting With Other Sections.)** In cases of direct conflict with the provisions of other sections of this ordinance relating to other classes, the provisions of the sections relating to Class VI shall govern in respect to tenement houses.

434. **Changes or Alterations—Permits.)** Every new tenement house and every change or alteration in any existing tenement house shall conform to the requirements of this chapter. No new tenement house shall be begun, nor shall any changes or alterations in any existing tenement house, such as are referred to in this chapter, be begun until a permit therefor shall have been issued by the Commissioner of Buildings. Such permit shall be issued only upon an application by the person, firm or corporation for whom the building is to be erected or altered, and after approval of the plans and specifications for such tenement house or for such changes or alterations by the Commissioner of Health whenever such approval is required by the ordinances of the City of Chicago.

435. **New Tenement House—When to be Occupied.)** (a) No new tenement house shall be occupied in whole or in part for human habitation until the issuance of a certificate by the Commissioner of Health that said building conforms to the requirements of this chapter relative to light and ventilation, plumbing and drainage applicable to said buildings, nor until the issuance by the Commissioner of Buildings of a certificate that the said building conforms to the requirements of this chapter relative to fire escapes and means of egress applicable to new tenement houses. Within five days from date of application for any certificate above mentioned, such certificate shall be issued or the official concerned shall state in writing his reasons for his refusal to issue said certificate.

(b) The certificate above referred to may be issued in the case of a new tenement building comprising more than three apartments so as to allow the occupation of any section of the building extending from cellar to roof in advance of the completion of the other portions of the building.

(c) When the outer walls of a new tenement house have been erected so as to outline the position of the courts and shafts required for the lighting and ventilation of habitable rooms, the owner of the building or his representatives shall be entitled, upon application in writing, to an inspection of the same by the Commissioner of Buildings, and if the work to that point is in compliance with the provisions regarding the size of shafts and the location of the building, to a certificate setting forth those facts.

(d) When the work of constructing partitions has advanced to a degree on any floor, that the rooms on that floor are determined in their dimensions, the owner or his representatives shall be entitled to an inspection from the Commissioner of Buildings, and if the rooms thus outlined conform in their dimensions to the plans filed and to the requirements of this chapter, to a certificate stating that fact.

(e) If a new tenement house is occupied as a place of habitation in any of its parts in violation of this section, it shall forthwith be subject to notice from the Commissioner of Buildings and shall be vacated upon such notice and shall not again be occupied until made to conform with the provisions of this chapter nor until after the issuance of the two certificates required in this section.

436. **Plat to be Filed.)** At the time of applying for a permit for the erection of, alteration of, addition to or moving of a tenement house or for the erection, alteration, adding to or moving of any building upon a lot upon which a tenement house stands, the

applicant shall submit to the Commissioner of Buildings a plat of the lot, showing the dimensions of the same and the position to be occupied by the proposed building or by the building to be altered or added to or by the building to be moved thereon, and the position of any other building or buildings that may be on the lot. The measurements shall in all cases be taken at the top of the first story and shall not include any portion of any street or alley.

437. **Corner Lot Defined—Frontages.)** By "corner lot" is meant a lot situated at the junction of two streets or of a street and a public alley at least sixteen feet wide, provided that if such alley be less than sixteen feet wide, and the lot be estimated on a line sixteen feet from the opposite side of the alley, such lot may be considered a corner lot. Any portion of the width of such lot distant more than fifty feet from such junction shall not be regarded as part of a corner lot, but shall be subject to the provisions of this chapter respecting other than corner lots. Where, in corner lots, the two frontages are of unequal length, the lesser street frontage shall be taken as the width of the lot. Street frontage alone, and not alley frontage shall be considered in determining such lesser frontage.

438. **Height—How Measured.)** (a) The height of a new tenement house shall not exceed by more than one-half the platted width of the widest street on which it abuts, and no existing tenement house shall be increased beyond such height.

(b) Provided, however, that any distance the building sets back from the lot line shall be added to the width of the street in making this computation. Such height shall be the perpendicular distance from the grade nearest the house to the highest point of the roof but shall not include as part of the roof any cornice or bulkhead less than eight feet high, or any elevator enclosure less than sixteen feet high. Where such street grade varies, the mean or average grade thereof opposite such house shall be the datum from which such height shall be measured.

439. **Distance Between Buildings.)** No existing tenement house shall hereafter be enlarged or its lot be diminished, so that the rear line of any building on such lot approaches nearer than ten feet to the rear line of the lot, unless the rear of the lot upon which it stands, abuts upon a public alley, in which case the rear line of such building shall be not less than sixteen feet from the opposite side of such alley. Where a tenement house, now existing or hereafter erected, stands upon a lot other than a corner lot, no other building shall hereafter be placed upon the front or rear of that lot, unless the minimum distance between such buildings be at least ten feet, if neither building exceeds the height of one story; or fifteen feet, if either building exceeds the height of one story, but not the height of two stories; and so on, five additional feet to be added to such minimum distance of ten feet for every story more than one, in the height of the highest building on such lot.

440. **Percentage of Area Allowed to be Covered.)** No existing tenement house shall hereafter be enlarged nor its lot be diminished, nor other buildings be placed on its lot, nor a tenement house be moved on a lot on which there is an existing building, so that after such change a larger proportion of any corner lot or other lot upon which it is situated is covered by buildings, than the following proportions, respectively: No new tenement house alone or with other buildings now or hereafter erected, shall occupy above the first story more than eighty-five per centum of the area of a corner lot, provided that in the case of a fireproof building, in which the windows of every habitable room open directly on a street, the portion of the lot covered may be ninety per centum of the area of said lot, subject to the requirement that a ten foot space must be left above the first story opposite the lesser frontage; or more than ninety per centum of the area of such corner lot if such corner lot is bounded on at least three sides by streets or alleys; or more than seventy-five per centum of the area of any other lot, provided that the space occupied by fire escapes, constructed and erected according to law and not more than four feet wide, shall be deemed unoccupied. Provided, however, that in case of a lot, triangular or irregular in shape bounded on two or more sides by a street and having a number of lineal feet street frontage exceeding one-twentieth of the number of square feet in the area of such lot, it shall not be necessary to comply with the conditions of this section as to percentage of lot which may be covered.

441. **Must Have Alley or Yard in Rear—Size of Yard Increased.)** At the rear of every lot containing a tenement house, there shall be a yard open and unobstructed from the earth to the sky, except by fire escapes not more than four feet wide, constructed and erected according to law, unless the rear of such lot abuts upon a public alley at least ten feet wide, in which case the rear line of such building shall be not less than 16 feet from the opposite side of such alley; every part of such yard shall be directly accessible from every other part thereof; such yard shall have an area of at least eight per centum of the superficial area of the lot on corner lots except as otherwise provided in this section; and on other lots, such yards shall have an area of at least ten per centum of the superficial area of the lot. Every such yard shall be increased one per centum of the superficial area of the lot for every story above three stories in height of the tenement house situated thereon.

442. **Courts—Inner—Outer—Lot Line.)** (a) "Inner courts" of all new tenement houses as defined in Section 432 of this ordinance, shall have minimum widths at every point and minimum areas as follows:

Courts—Height of	Least width in feet.	Least area in square feet.
1 story	6	100
2 stories	6	120
3 stories	8	160
4 stories	8	160
5 stories	12	260
6 stories	16	400
7 stories	20	625
8 stories or more.	24	840

(b) The height of a court shall be the number of stories having habitable rooms with windows in its walls.

(c) "Outer courts" and "lot line courts" of all new tenement houses as defined in Section 432 of this chapter shall have minimum widths at every point equal to one-half of the minimum widths required by this section, and lot line courts shall have minimum areas equal to one-half of the minimum areas required herein for "inner courts."

(d) The minimum widths hereinbefore specified for outer courts and the minimum widths and areas specified for lot line courts are to be provided irrespective of the presence of or dimensions of courts on other premises bounded by the same lot line.

(e) Every "inner court" and every "lot line court" of every new tenement shall be connected directly with a street, alley, yard, or outer court by an opening extending from grade at the building to a height of at least fifteen feet, and kept unobstructed save by

an openwork grill or gate, such opening to be at least two feet wide for an inner court and one foot wide for a lot line court. In case of a three-story tenement on a lot twenty-five feet or less in width, a continuous lot line passage open to the sky, and six inches in width, shall be accepted for the opening specified above as one foot wide for a lot line court. If such inner court or lot line court starts from any point above finished grade at building, such starting point shall be considered as grade for purpose of determining the location of the opening to outer air herein specified.

(f) In case of a three-story tenement on a lot twenty-five feet or less in width a continuous lot line passage open to the sky, and at least three feet wide, shall be accepted in lieu of a lot line court or outer court hereinbefore specified in Paragraph (a).

(g) In case of a two-story tenement on a lot twenty-five feet or less in width, a lot line court having an area of at least fifty square feet shall be accepted in lieu of a lot line court heretofore specified in Paragraph (a) of this section, and in case of a three-story tenement on a lot of twenty-five feet or less in width, a lot line court having an area of at least sixty square feet shall be accepted in lieu of a lot line court hereinbefore specified and required by Paragraph (a) of this section.

(h) In case of two or three-story tenement buildings on lots twenty-five feet or less in width, where there is only one apartment on each story containing not more than four rooms in such apartment, the light courts hereinbefore specified in Paragraph (a) may be omitted, provided there is a continuous passageway open to the sky and not less than three feet wide on one side of said building.

443. **Vent Shaft—Area Of.)** (a) "Vent shafts" of all new tenement houses, as defined in Section 454 of this ordinance, shall have minimum widths at every point and minimum areas as follows:

Vent shafts Height of	Least width in feet	Least area in square feet.
1 story	3	21
2 stories	3	22½
3 stories	3	27
4 stories	3	36
5 stories	5	48
6 stories	6	72
7 stories	8	96
8 stories or more.	8	120

(b) Every such vent shaft in every new tenement house more than two stories high, shall be connected directly with a street, alley, yard or court by one or more horizontal ducts or intakes at a level not lower than the finished grade of building nor higher than second story floor; the total area of such ducts to be not less than three per cent of the area of such vent shaft, and no single duct to be of less area than one hundred square inches; such total and individual duct area shall be net over and above all obstructions.

444. **Stair Hall and Shaft—Well-Hole Dimensions.)** (a) Every public stair hall in every new tenement house shall, for each story, have a window of an area of at least twelve square feet, opening directly on a street, alley, yard or court; or on a shaft of minimum area, as hereinafter provided; or shall have an unobstructed vertical well-hole of the following minimum area at each floor line above the first, and, directly over such well-hole, there shall be a skylight of twice the following minimum area:

Building— Height of	Least area in square feet of stair shaft or well hole.
2 stories—if there is more than one apartment on a floor	8
3 stories—if there is more than one apartment on a floor	13
4 stories	19
5 stories	25
6 stories or more	38

(b) Such window, if any, shall be so placed that light may pass directly to the opposite end of the hall, or else there shall be at least one window opening directly upon a street, alley, yard or court in every twenty feet in length or fraction thereof of such hall, except in so much of any entrance hall as lies between the entrance and the flight of stairs nearest the entrance. In any such public hall, recesses or returns, the length of which does not exceed twice the width of the hall, will be permitted, without an additional window, but, otherwise, each recess or return shall be regarded for the purposes of this section as if it were a separate hall. Any part of a public hall which is shut off from any other part by a door or doors shall be deemed a separate public hall within the meaning of this section.

(c) Skylights shall be ventilating skylights and shall have over them a wire netting mounted on wire frame and 6-inch iron legs, of wire not lighter than No. 12 and with mesh not coarser than one inch by one inch, unless constructed of wired glass or prismatic light glass.

445. **Rooms—Sizes and Height Of—Attic Rooms.)** (a) In every new tenement house, all habitable rooms shall be of the following minimum sizes:

(b) In each apartment, there shall be at least one room containing not less than one hundred twenty square feet of floor area, and every other room shall contain at least eighty square feet of floor area, provided, however, that in the case of a room having a window not less than eighteen feet in area opening upon a public street, the floor area need not be greater than seventy feet. Each room shall be in every part not less than eight feet six inches high from the finished floor to the finished ceiling; provided, however, an attic room need be eight feet six inches high in but one-half of its area, provided there are not less than 750 cubic feet of air space therein.

446. **Alcoves and Alcove Rooms.)** (a) For the purpose of buildings of Classes III and IV, an alcove shall be defined as a recess connected with or at the side of a larger room. The floor of such an alcove shall be counted as a part of the floor area and its cubic contents as a part of the cubic contents of the room with which it is connected.

(b) In every new tenement house every alcove shall be deemed a separate room for all purposes within the meaning of this chapter, except an alcove that has a floor area of not to exceed thirty-five square feet and that has an unobstructed opening, equal in area to twenty per centum of its entire wall surface, into an adjoining habitable room; provided that in constructing additional habitable rooms by raising or altering existing one story dwellings, the limitation of the floor area of an alcove may be disregarded, provided such alcove has an unobstructed opening, equal to the floor area of such alcove, into an adjoining habitable room.

(c) This section shall not be construed as forbidding the erection of pilasters or other decorative effects projecting not more than eighteen inches from the plane of the wall of a habitable room.

(d) No part of any room in a tenement house shall be enclosed or sub-divided at any time, wholly or in part, by a curtain, portiere, fixed or movable partition or other contrivances or device, unless each part of the room so enclosed or sub-divided shall contain a separate window as herein required, and shall have a floor area of not less than 80 square feet as herein required

for habitable rooms, except as heretofore provided in this section.

447. **Air—Quantity of for Each Person.)** No room in any tenement house shall be occupied so that the allowance of air to each adult person living or sleeping in such room shall at any time be less than four hundred cubic feet or less than two hundred cubic feet for each person under twelve years of age.

448. **Habitable Rooms—Bath Rooms—Pantries—Requirement as to Ventilation and Lighting.)** (a) In every new tenement house every habitable room shall have a window or windows with a total glass area opening onto a street, alley, yard or court. None of such required windows shall have a glass area of less than ten square feet, and each such window shall have its top not less than seven feet above the floor and shall be so constructed that at least its upper half may be opened its full width.

(b) In every new tenement house every bath room, water closet, or urinal compartment shall have at least one window with a glass area of at least six square feet and a minimum width of one foot, opening upon a street, alley, yard, court or vent shaft.

(c) In every new tenement house every pantry shall have at least one window of not less than six square feet in area, with a width of not less than one foot, opening into a street, alley, yard, court or vent shaft, which vent shaft shall be at least six square feet in area.

449. **New Tenements—Habitable Rooms in Basements—Prohibited in Cellars.)** In no new tenement house shall any room in the cellar be constructed, altered, converted or occupied for living purposes; and no room in the basement of a new tenement house shall be constructed, altered, converted or occupied for living purposes unless such rooms shall be at least eight feet six inches high in the clear and shall have at least one-half of such height above the finished grade of said premises at the building, and at least four feet three inches of such height above the average street grade at the building.

450. **Tenement Houses—Requirements for Fireproof and Slow-burning Construction.)** Every new tenement house more than five stories and basement high shall be of fireproof construction. Every new tenement house more than three stories and basement high, but not more than five stories and basement high shall be of slow-burning or fireproof construction. In case slow-burning construction be required, the cellar and basement construction, including the floor construction of the first story above the cellar or basement, shall be of fireproof construction.

451. **Frame Tenement—Requirements.)** In every new frame tenement house outside the fire limits, each suite of apartments shall be separated from the next suite in such building by a wall of four-inch tile or of metal studding and metal lath, and the enclosing walls around the stairs, where there are two or more apartments on a floor, shall be of fireproof construction or of solid masonry of the same dimensions as are required by Section 519.

452. **Frame Additions to Frame Tenement Houses Within the Fire Limits Not Permitted.)** No frame addition shall be permitted to any frame tenement house within the fire limits, either by adding to its height or its superficial area. If a tenement house standing on wooden supports is moved to another lot or another position on the same lot it shall not again be placed on wooden supports, but shall be placed on a masonry or concrete foundation.

453. **Entrance Halls—Solid Masonry—Exceptions—Ceilings.)** Every main entrance hall in a new tenement house shall be at least three feet six inches wide in the clear from the entrance up to and including the stair enclosure and beyond this point at least three feet wide in the clear. In every new non-fireproof tenement house, except where there be only one apartment on each floor, such entrance hall shall be inclosed with solid masonry walls and with ceilings covered with incombustible material and shall comply with all the conditions of the following sections of this ordinance as to the construction of stair halls. If such main entrance is the only entrance to more than one flight of stairs, the several portions of such main entrance hall which separate the entrance of the building from the several flights of stairs, respectively, shall be increased respectively at least one foot in width for each additional flight of stairs.

454. **Stair Halls—Construction of.)** (a) The stairs and stair halls in all new tenement houses more than three stories and basement or cellar high shall be constructed of incombustible material throughout, except that the treads of stairs may be of wood not less than one and three-eighths inches thick and all handrails may be of hardwood.

(b) In every new non-fireproof tenement house all stair halls shall be enclosed on all sides with walls of solid masonry of the dimensions required by Section 519. All windows in stair halls, except where same open into a street, alley, outer court, or yard, shall have metal frames and sashes, glazed with wired glass. This section shall not apply to tenement houses which are not more than three stories and basement high with only one apartment on each floor.

455. **Apartments Divided by Masonry.)** There shall be a wall of solid masonry, as required by Section 519, extending from the ground to the roof between each set of apartments and around each court and each light shaft, except as hereinafter provided; (a) provided, however, that a wall between apartments and extending from the main stair hall to the outer wall of the building may be offset at the second story floor line to some point nearer the center of the building, or of the group of apartments, to admit of an even distribution of space in the rooms adjacent to such wall, if such wall is supported at the second story floor line on fireproof steel or iron beams which extend from the brick wall surrounding the main stair hall to the outer wall of the building; and provided, further, that such offset wall may be reduced to the thickness of eight inches, if supported at each floor line above the first story on fireproofed steel or iron beams carried by masonry walls as above specified; (b) and provided, however, that, in case there is a store or stores in the first story of a building of this class, a masonry dividing wall between apartments may begin at the second story floor line, if such dividing wall is supported on fireproofed steel or iron beams carried by masonry; and provided, further, that such dividing wall may be reduced to the thickness of eight inches, if supported at each floor line above the first story on fireproofed steel or iron beams carried by masonry. And provided that in buildings of fireproof construction the partitions between apartments, and around stairs may be of burnt clay tile not less than three inches in thickness or reinforced concrete partitions not less than three inches in thickness.

456. **Ceilings Over Stores—Courts and Shafts Beginning Above First Story.)** (a) In every new non-fireproof tenement house in which there is a store or stores in the first story, if the building is three stories or less in height, the portions of the first

story ceiling directly under all public halls shall be of slow-burning construction, and if the building is four or more stories in height the entire basement and first story construction and the second story floor construction shall be of fireproof construction.

(b) In every new non-fireproof tenement house the masonry walls enclosing every court or light or vent shaft beginning above the first story shall be supported on fireproofed steel or iron beams carried by masonry or by fireproofed steel or iron columns; and such court or shaft enclosing walls may be reduced to the thickness of eight inches if supported at every intersecting floor line on fireproofed steel or iron beams carried as above specified.

457. **Damp-Proofing—Basement Walls to Be Masonry—Cement Floor.)** In every new tenement house constructed of brick or frame, the foundations and basement walls shall be built of masonry or concrete not less than twelve inches in thickness, except as provided in Section 519 and shall have all outside walls below the adjacent ground level plastered on the outside with Portland cement or treated with other approved damp-proofing material, and such walls, as high as the ground level, shall be laid in cement mortar. The basement or cellar of every existing and new tenement house shall have a floor of Portland cement concrete not less than three inches in thickness laid on not less than six inches of sand or cinders.

458. **Bay Windows—Courts—Vent Shafts.)** (a) The walls of every bay window and every court in masonry constructed new tenement houses shall be built of brick or other fireproof construction as required for exterior walls.

(b) The walls of every vent shaft in masonry constructed tenement houses shall be built of masonry or of fireproof material not less than four inches in thickness, supported by steel or iron.

459. **Porches.)** Where porches are constructed in courts of now existing or new tenement houses, the amount of area of unobstructed space in such courts shall be exclusive of space occupied by stairs and porches. No additional rear porch shall be constructed on any existing tenement house in such way that the buildings on the lot with all their porches shall occupy a greater proportion of the lot than is permitted in Section 440 of this chapter. No rear porch on any existing tenement house where the total area of buildings and all porches exceeds the proportion of the lot permitted in Section 440 of this chapter shall be reconstructed until the plan for such re-construction shall have been submitted to and approved by the Commissioner of Buildings. No rear porch built of combustible materials and more than eight feet in width, excepting stairways, shall be constructed on any new tenement house nor added to, nor reconstructed on any existing tenement house.

460. **Flues and Chimneys.)** In every building used for the purposes of Class VI. the flues or chimneys shall conform to the following regulations: For one stove opening, the flue area shall be not less than forty-nine square inches. For more than one stove opening and one furnace opening, the flue area shall be not less than seventy-seven square inches. All such flues shall have linings of burnt fire clay or terra cotta closely fitted together and slushed in, and such flue linings shall extend from the lowest opening to a distance of at least two feet above the roof joists.

461. **Bulkhead in Roof—Construction of —When Required.)** There shall be in the roof of every new tenement house, unless the pitch of the roof thereof exceeds one foot rise in four foot run, at least one bulkhead or scuttle, fireproof or covered with fireproof material, with stairs or ladder leading thereto; no such roof opening shall be less than two feet by three feet. Where such tenement house is provided with rear stairs, there shall be a bulkhead or scuttle accessible from each of such rear stairs. No scuttle or bulkhead door shall have any lock on it but may be fastened on the inside by movable bolts or hooks.

462. **Stairways—Width and Construction of.)** (a) Every now existing and every new tenement house shall have at least two flights of stairs, which shall extend from the entrance floor to the top story, and which stairs shall be as far apart as practicable. One of said stairways shall be an interior stairway. Such stairs and the public halls in every tenement house shall each be at least three feet wide in the clear, and every apartment shall be directly accessible from both such flights of stairs. In a fireproof building, where a public corridor serving two or more apartments, leads directly to a stairway, such corridor and stairway will be credited as one of the two required stairways. If any existing tenement house be so altered as to increase the number of apartments therein, or if such building be increased in height, or if the halls and stairs therein be damaged by fire or otherwise to an extent greater than one-half the value thereof, the entrance, stair halls, entrance halls and other public halls of the building so damaged shall be made to conform to the requirements of this chapter relating to new tenement houses.

(b) All enclosed stairs in every tenement house shall have at least one handrail, and where the width of such stairs is greater than 3 feet 6 inches, such stairs shall have a handrail on each side thereof. All open stairs shall be provided with suitable and substantial handrails on each side.

463. **Stairs in Non-Fireproof Buildings, Eighty or More Rooms.)** Every new non-fireproof tenement house containing over eighty rooms, exclusive of bath rooms, shall have one additional flight of stairs, over and above the flights hereinbefore provided for for every additional eighty rooms, or fraction thereof; but if such building contains not more than one hundred and twenty rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building shall be at least one-half wider than is provided in this chapter.

464. **Stairs in Fireproof Buildings, One Hundred and Twenty Rooms and Upward.)** Every new fireproof tenement house containing over one hundred and twenty rooms exclusive of bath rooms, shall have one additional flight of stairs, over and above the flights hereinbefore provided for, for every additional one hundred and twenty rooms or fraction thereof; but if such building contains not more than one hundred and eighty rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway the stairs and public halls throughout the entire building may be made at least one half wider than is provided in this chapter.

465. **Stairs—Entrance to—Treads and Risers.)** Every flight of stairs required in a tenement house shall have an entrance on the entrance floor from a street or alley or from a yard or court which opens into a street or alley. All stairs except rear stairs in new tenement houses, shall have risers not more than seven and three-quarter inches high and treads not less than nine and one-half inches wide exclusive of nosings, except in winding stairs, where a treads at a point eighteen inches from the strings on the well side shall be at least

nine and one-half inches wide, exclusive of nosings.

466. **Fire Escapes.)** Every tenement house four or more stories in height shall be provided with a fire escape or fire escapes, such as are required by this chapter. In every case each separate apartment shall have direct access to at least one such fire escape unless such apartment shall have direct access, without passing through any other apartment, to at least two separate flights of stairs leading to the ground, one of which is placed in front and one in the rear of such building, and one of which may be placed outside of the building; but where such separate apartment shall not have access to two such flights of stairs, then such apartment shall have direct access to a stairway fire escape. Every court in which there is a fire escape shall have direct and unobstructed access along the surface of the ground to a street or alley or to yard opening into an alley or street without entering into or passing through or over any building unless by a four foot wide fireproof passage on the court or ground level. Except as herein specifically provided, the number, location, material and construction of fire escapes shall be controlled by the general provisions of this chapter on fire escapes.

467. **Stairways and Fire Escapes to Be Free From Obstruction.)** No obstruction of any kind shall at any time be placed before, upon or against any stairway, steps or landings or fire escapes in or upon any tenement house. All fire escapes upon tenement houses shall be kept in good order and repair, and every exposed part thereof shall at all times be protected against rust by durable paint.

468. **Shafts, Courts, Yards, Graded—Concrete—Drained.)** In every now existing and new tenement house, the bottom of all shafts, courts or yards shall be provided with sanitary drainage and shall be graded or paved.

469. **Access to Rooms—Otherwise than Through Bedroom.)** In each apartment in every new tenement house, access to every living room and bedroom, and to at least one water closet compartment shall be had without passing through any bedroom.

470. **Water Closets—Windows in—Artificial Light.)** (a) In every new tenement house there shall be a separate water closet in a separate compartment within each apartment, except that where there are apartments consisting of only one or two rooms, in which case there shall be at least one water closet for every two apartments.

(b) Every water closet compartment in every existing tenement house shall be ventilated by such a window, or else by a vent shaft of at least one-half the minimum area required in Section 443. Every water closet compartment in every tenement house shall be provided with proper means of artificially lighting the same. If fixtures for gas or electricity are not provided in any such compartment, then the door thereof shall have ground glass panels or transoms.

471. **Sinks—Requirements.)** In every new tenement house there shall be in each apartment at least one kitchen sink with running water. In every existing tenement if there be not one such sink in each apartment there shall be on every floor at least one kitchen sink with running water, accessible to all the tenants of the floor, without passing through any other apartment. In no tenement house shall there be woodwork inclosing sinks; the space underneath sinks shall be left entirely open.

472. **Pipes Through Floors—Catch Basins—Water Closets.)** (a) In every new tenement house where plumbing or other pipes pass through floors or partitions, the openings around such pipes shall be sealed tight with plaster or other incombustible material, so as to prevent the passage of air or the spread of fire from one floor to another or from room to room.

(b) In the premises of a tenement house the catchbasin shall, whenever practicable, be placed in a court or yard, and shall be covered with a stone or iron cover, flush with the surface so that access to such basin shall be convenient.

(c) Where it is for any reason impracticable to place a catchbasin in a court or yard, the Commissioner of Health may authorize the use of an iron catchbasin with air-tight cover, located in the cellar or basement.

472½. **Buildings Damaged by Fire, Etc.)** If any existing tenement house is hereafter damaged by fire or other cause, including ordinary wear, so that at any time its value be less than one-half its original value exclusive of the value of the foundations, such building shall not be repaired or rebuilt except in conformity with the provisions of this ordinance applicable to new tenement houses.

473. **Provisions of this Article Not to Apply to Existing Buildings, Except Under Certain Circumstances—Then Commissioner to Notify.)** (a) Nothing in this Article contained shall be construed as requiring alterations in the construction or equipment of buildings in existence at the time of the passage of this Article and which at the time of their construction were built in compliance with the ordinances then in force, unless they are in conflict with the requirements of Sections 447, 466, 471, 475, 476, 477, 468, or unless such buildings shall not have sufficient or adequate means of egress therefrom, by reason of insufficient or inadequate stairways, improperly located or insufficient or inadequate elevators or elevator equipment, doors, fire escapes, windows or other means of egress or ingress.

(b) Where it shall appear to the Commissioner of Buildings that any such building has insufficient means of egress therefrom as aforesaid, he shall notify the owner, agent or person in possession, charge or control of such building of such fact and direct him forthwith to make such alterations and changes in the construction or equipment of such building, as are necessary to be made in order to promote the safety of the occupants of such building and of persons using the same and of the public.

474. **Rooms and Halls—Additional.)** Every room or hall that may hereafter be constructed or created in an existing tenement house shall comply in all respects with the provisions of this ordinance as to size, arrangement, light and ventilation of rooms and halls.

475. **Rooms—Change in Existing.)** No room in any now existing tenement house shall hereafter be constructed, altered, converted or occupied for living purposes unless it contains a window having a superficial area not less than one-twelfth of the floor area of the room, which window shall open upon a street or alley or upon a yard or court having a superficial area of not less than twenty-five square feet; or unless such room adjoins another room in the same apartment, which other room shall have such a window opening upon such a street, alley, yard, or court, and between which two adjoining rooms there shall be a sash window having at least fifteen square feet of glass the upper half of which shall be so made as to open easily.

476. **Windows—Courts—Attic.)** No room in any now existing tenement house, which has no such window as aforesaid, opening upon a street or alley or upon a yard or

court having a superficial area of not less than twenty-five square feet, shall hereafter be constructed, altered, converted or occupied for living purposes, unless it contains a floor area of at least sixty square feet and also at least six hundred cubic feet of air space; nor unless every part of the finished ceiling of such room be at least seven feet six inches distant from every part of the finished floor thereof; provided, that an attic room need be seven feet six inches high in but one-half of its area, and, provided, further, that such attic room has not less than seven hundred fifty cubic feet of air space therein; and such attic room shall not be used for purposes of human habitation other than as a sleeping room.

477. **Existing Tenements—Living Rooms in Cellars or Basements—When Permitted.)** In every existing tenement house, no room in a cellar or basement shall be constructed, altered, converted, or occupied for living purposes unless such room shall be at least seven feet six inches high in the clear, and have not more than four feet eight inches of such cellar or basement below the finished grade at building; provided that no such room shall be used for living purposes unless such room shall have a window opening upon a street, alley, yard or court, and, provided, that when the windows of any living room front solely upon a street and the floor of such basement is four feet eight inches below the sidewalk grade, such windows shall be located not less than three feet back from the lot line. Provided, however, that in every case where the height of ceiling of any living room is less than eight feet six inches in the clear, the window area of such room shall be at least fifteen per centum of the floor area.

477½. **Insanitary Conditions—Nuisance.)** A tenement house or part thereof which is in an insanitary condition by reason of the basement or cellar being damp or wet, or by reason of the floor of such basement or cellar being covered with stagnant water or by reason of the presence of sewer gas, or by reason of any portion of such building being infected with disease, or being unfit for human habitation, or which by reason of any other insanitary condition is a source of producing sickness among the inhabitants of this city, or which in any way endangers the public health, is hereby declared to constitute a public nuisance.

ARTICLE X.

Class VII.

478. **Class VII Defined.)** In Class VII shall be included every building used for the sale at retail of dry goods and other articles of general merchandise and commonly known and described as a department store.

478½. **Must Comply With General and Special Provisions.)** Every building of Class VII shall comply with the general provisions of this chapter, and, in addition to the general provisions, shall comply with the following special provisions:

479. **Buildings of Class VII—Construction of.)** Buildings three stories or less in height, used either wholly or in part for the purpose of Class VII, may be of ordinary construction. Such buildings more than three and not exceeding five stories in height shall be of slow-burning, mill or fireproof construction. Such buildings over five stories in height shall be of fireproof construction.

480. **Stores Used for Retail Sale of Goods or Manufacturing Purposes—Occupation of Basement—Lockers.)** (a) Not more than the lower twelve stories above the street grade shall be used for the retail sale of goods, or for locker provisions in excess of accommodations for the number of employes on the floor on which they are employed, or for manufacturing purposes in a building devoted wholly or in part to purposes of Class VII except as hereinafter provided; provided, however, the stories above the twelfth story may be used for these or other purposes when equipped with an approved outomatic sprinkler system approved by the Fire Marshal; and further provided, that all such buildings hereafter erected to be used for these purposes, or so used, above the twelfth story shall in addition to being equipped with an approved automatic sprinkling system have enclosed stairways.

(b) Not more than one floor of any basement or cellar shall be used for the retail sale of goods. Such floor shall be the nearest to the inside street grade. Such floor used for the retail sale of goods shall not be more than twenty feet below the inside street grade.

(c) No sub-basement, cellar or part of a basement below such floor shall be used for the sale of any goods in any manner, but locker and dressing rooms may be placed in the sub-basement, provided the space thus occupied be separated from the remainder of the basement by fireproof partitions, and that there be at least two flights of stairs placed as far apart as practicable leading therefrom to the first floor, inclosed in fireproof partitions. Such stairs from such locker or dressing rooms shall be, in addition to other stairways required by this chapter for such buildings, and at least one of such stairways shall open directly on a street, alley or court opening on a street or alley, or on a fireproof passage leading to the street, alley or such court. Where more than five lockers are in one room, such lockers shall be of incombustible material.

(d) Where stories above the twelfth story are used for the purposes of Class VII as hereinbefore described for locker provisions in excess of accommodations for employes on the floor on which they are employed, then the stairways from the first to the topmost floor shall be built and inclosed as described in Section 668, but the stairways shall be in number and aggregate width as required in the table for stairways set forth in Section 666 of this chapter.

481. **Floor Areas—Maximum.)** (a) The floor area, except as hereinafter provided, of any one story or portion of a story used for the purposes of Class VII of any building of ordinary construction shall not exceed nine thousand square feet.

(b) The floor area, except as hereinafter provided, of any one story or portion of a story used for the purposes of Class VII of any building of slow-burning or mill construction shall not exceed twelve thousand square feet.

(c) The floor area, except as hereinafter provided, of any one story or portion of a story used for the purposes of Class VII of any building of fireproof construction shall not exceed 25,000 square feet, unless the building is completely equipped with an approved automatic sprinkler system, but in no case shall such area exceed 30,000 square feet.

482. **Floor Areas—Exceeding the Maximum Limits Defined in Section 481.)** (a) Where any floor or portion of a floor used for the purposes of Class VII in any building shall exceed in area the maximum number of square feet allowed in the preceding section for the type of construction of such building in which such floor is contained, each such maximum amount of floor area so used shall be separated from other parts of such floor by fire walls, or dividing walls built in accordance with the provisions of Section 250 of this chapter relating to dividing walls in buildings of Class I.

(b) Where any such floor so used is divided by such fire walls or dividing walls, each such division of such floor shall be provided with stairs, aisles, exits, and fire escapes as required in this chapter for separate and distinct buildings, and each such division shall be considered as a separate building, except as provided in Section 508 of this chapter.

483. **Galleries.)** (a) The area of any or all of the galleries, mezzanine or intermediate floors in any one story used wholly or in part for the purposes of Class VII in any building shall not exceed ten per centum of the area of such story. Galleries, mezzanine or intermediate floors of a larger size than the above shall be considered as full stories.

(b) Every gallery, mezzanine or intermediate floor shall have at least one stairway not less than three feet wide.

(c) The height from the floor of any gallery, mezzanine or intermediate floor to the ceiling over same shall not be less than seven feet, and there shall be not less than seven feet of space between the bottom of such gallery, mezzanine or intermediate floor and the floor of the story in which such gallery, mezzanine or intermediate floor is placed.

(d) Every gallery, mezzanine or intermediate floor in any building used for the purposes of Class VII shall be built to conform to the construction applicable to such building, but galleries not exceeding five per centum of the area of such story, may be built of incombustible material without fireproof protection.

(e) No gallery, mezzanine or intermediate floor shall be built without a permit from the Department of Buildings, and plans showing the construction and size of such proposed gallery, mezzanine or intermediate floor shall be filed with the Department of Buildings when a permit is applied for.

484. **Courts of Class VII Buildings.)** (a) Every court or light shaft of every building used wholly or in part for the purposes of Class VII shall be open and unobstructed from the bottom of such court to the sky, with the exception that fire escapes may be built therein, and such courts shall have walls constructed in the same manner as is required for the exterior walls of such buildings; provided, that no walls inclosing such courts are required on street or alley lot lines.

(b) All windows, doors or other openings in court walls of such buildings shall have metal frames, metal sashes and metal doors, with the glazed portions thereon of wired glass.

485. **Stories—Number of.)** The first story above the inside street grade shall be designated and known as the first story for all purposes of this chapter, and the stories above shall be numbered consecutively, the second, third, and so on.

486. **Stairs — Halls — Passageways and Aisles—Signs and Lights.)** (a) The stair halls, passageways and stair aisles shall be unobstructed and be as wide as the stair and not less than four feet wide in the clear.

(b) The exit door or doors between floors and stair halls shall be not less than ninety per centum of the width of the stairway to which they afford access, and for each elevator opening into such a stair hall, the doors to floors shall be increased six inches in width.

(c) The stairways and stair halls of any building used wholly or in part for the purpose of Class VII shall be illuminated by gas or electric light, and the gas piping and the electric wiring shall be accomplished by piping and circuits separated and distinct from the general illuminating piping and circuits of the premises. Each stair light shall have a red glass inclosure.

(d) At the bottom of each such stairway there shall be an illuminated red glass sign with the number of the story in which it is situated inscribed thereon in letters not less than six inches high.

487. **Aisles in Class VII Buildings.)** (a) In buildings used wholly or in part for the purposes of Class VII there shall be aisles in such portions of the buildings as are used for such purposes, connecting the stairways and the elevators directly with the street or alley doors, and such aisles shall be termed "main aisles." Such main aisles shall have a clear width equal to the width of the stairways connecting therewith, and for each elevator connecting with such an aisle there shall be an additional width of six inches, and no such main aisle shall be less than five feet wide in the clear between the counters in any department store or between the fixed seats therein. One-third the width of any basement stairway shall be added to the width of the main aisle connecting with such stairway.

(b) If there is a column in any such aisle, then the width of the aisle shall be increased by the width of such column.

(c) If there is a counter, or counters, or settee, or any case, or other obstruction in an aisle, then that part of the aisle on each side of such counter, bench or case, or other obstruction shall be considered as a separate aisle. No aisle shall be less than three feet in width.

488. **Exit Signs and Lights.)** (a) All exits in buildings used wholly or in part for the purposes of Class VII shall be clearly indicated by illuminated red signs with the word "Exit" thereon in letters not less than six inches high. At the bottom of each stairway on the street floor level there shall be similar signs indicating the direction of the nearest exit to a street or alley.

(b) Fire escape doors or windows shall be indicated by illuminated red signs with the words "Fire Escape" thereon in letters not less than six inches high.

489. **Doors at Street Level—Revolving Doors.)** The clear width of the exit openings shall be computed in the same manner as that provided in this Article for main aisles, and no door openings shall be less than five feet wide and all doors shall swing outward. Revolving doors shall not be considered as exits unless the revolving wings are so arranged that they will be readily collapsed or removed by pressure or simple mechanical means to be approved by the Commissioner of Buildings, and leave sufficient opening for two or more persons to pass through side by side.

490. **Doors in Dividing Walls.)** (a) Door openings may be built in dividing walls of such buildings; provided, however, that such door openings shall be not less than five feet in width and shall be provided with fire-proof doors built as described in Section 573 of this chapter, and that each door shall have an efficient closing device which will operate automatically in the event of a fire in close proximity to either side of such door.

(b) Each such opening shall have exit signs and lights as provided for street doors and exit signs in Section 488 of this chapter. There shall be aisles not less than five feet in width connecting with such doors from the main aisles, and in no case shall any such door be less than ninety per centum of the width of the aisle directly connecting therewith.

491. **Loads—Allowance for Live Loads in Construction of Floors of Buildings of Class VIII.)** For all buildings of Class VII the floor shall be designed and constructed in such a manner as to be capable of supporting, in addition to the weight of the floor

construction, partitions, permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floors. and shall be figured in accordance with Section 516 of this chapter.

ARTICLE XI.

Class viii.

492. **Class VIII Defined—Provisions of.)** In Class VIII shall be included every building used for school purposes and having a seating capacity of more than one hundred students.

492½. **Must Comply With General and Special Provisions.)** All buildings of Class VIII shall comply with the general provisions of this chapter wherever the same are applicable thereto, and in addition to the general provisions shall comply with the following special provisions:

493. **Construction of.)** (a) All buildings hereafter erected and used or intended to be used wholly for the purposes of Class VIII shall be constructed in accordance with the provisions of this chapter relating to Class VIII; and existing school buildings shall comply with the provisions of Class VIII with reference to stairs, exits and fire escapes.

(b) Buildings which have a seating capacity of two hundred or less and which are not over two stories and basement in height, may be built of ordinary construction; provided, that no portion of such building shall be used for assembly hall purposes.

(c) Buildings which have a greater seating capacity than two hundred and not exceeding four hundred, and which are not over three stories and basement in height, shall be built of slow-burning or fireproof construction.

(d) Buildings which have a greater seating capacity than four hundred, or which are more than three stories and basement in height, shall be built entirely of fireproof construction.

(e) Additions to existing buildings shall be built of the several types of construction required by this section; provided, however, that the sum total of the seating capacity of the entire building, including additions, shall be counted in determining the type of construction required for such addition.

(f) All alterations in existing buildings used for the purposes of Class VIII, other than new additions thereto, and intended to make them comply with the requirements of this chapter, may be executed in the same kinds of materials originally used in such buildings, unless otherwise distinctly provided herein.

494. **Walls—Window Openings in.)** No wall of any building used for the purposes of Class VIII and containing a window opening shall be nearer than five feet to any lot line of adjoining property, street and alley lines not included.

495. **Portable Frame Buildings.)** Portable frame buildings used wholly for the purposes of Class VIII, not larger than 28 by 36 feet and not over one story high, may be erected, provided exterior walls and roof of same are covered with metal or other incombustible material, and the interior woodwork painted with fire-retarding paint approved by the Commissioner of Buildings; and, provided, further, that the location of such buildings shall be approved by the Commissioner of Buildings. Such portable buildings shall not be located nearer than ten feet to any other building, and shall not be maintained on any one lot or block for a longer period than two years after the date of the issuance of the original permit.

496. **Assembly Halls—Limitations as to Seating Capacity and Floor Level.)** (a) The limit of height at floor level and the maximum seating capacity of assembly halls or auditoriums or other single rooms in buildings of this Class must not exceed the numbers given in the following table, for the specified type of construction, to-wit:

Floor—Height of Above Grade.	——Type of Construction—— Slow burning or Mill Construction Having Fireproof Fireproof Construction.	Stairs and Corridors.	Ordinary Construction.
	Persons.	Persons.	Persons.
Over 60 ft.....	500	100	...
60 ft. or less..	600	300	...
45 ft. or less..	700	500	...
30 ft. or less..	1000	800	250
20 ft or less..	1500	900	500
10 ft. or less..	2000	1000	800
5 ft. or less..	2500	1200	1000

(b) All assembly halls or other single rooms having a seating capacity larger than that given in the above table must have the highest part of the main floor within not more than one foot of grade level and must have exits leading directly to three streets, public alleys, or to open public grounds.

(c) Seating capacity of all assembly halls in buildings of this Class shall include the total aggregate seating capacity of all balconies, galleries, stages and platforms as well as the main portion of such assembly hall or rooms.

(d) Heights of assembly hall floors shall be measured from sidewalk level at entrance of building or open school grounds to highest part of main floor of such assembly hall or rooms.

497. **Stairways—Width of.)** (a) Stairways in buildings used for the purposes of Class VIII shall be equivalent in width to fifteen inches for every hundred of seating capacity in such building as measured by the aggregate seating capacity of the auditorium, assembly rooms and school rooms; provided, however, that the number of persons allowed in such buildings at any one time shall be limited by the width of stairways available as exits therefrom.

(b) No stairway shall be less than four feet in the clear, except where more than two stairways lead down from any floor, in which case stairways three feet in width in the clear may be counted in the total width of stairs required.

(c) Where two or more stairways are used, they shall be placed at opposite ends of the building or as far apart as practicable, and all such buildings hereafter erected shall have at least two separate and distinct stairways from the ground floor to the top floor, and all existing buildings shall have two such separate and distinct stairways, or one stairway and one sliding or stairway fire escape.

(d) All stairways shall have railings on each side thereof. No stairway shall ascend a greater height than thirteen feet six inches without a level landing, the dimensions of which, in the direction of the run of the stairs, shall be not less than four feet, or which, if at a turn of the stairs, shall be of not less width than the width of the stairs. No winder shall be permitted in any stairs. Stairways which are over nine feet wide shall have double intermediate handrails with end newel posts at least five and one-half feet high. All stairways shall discharge at the bottom directly to a public thoroughfare or open ground.

498. **Stairways in Buildings Hereafter Erected—Fireproof.)** In buildings hereafter erected more than two stories and basement in height, the stairways and their enclosing walls shall be of fireproof construction.

499. **Width of Corridors, Passageways, Hallways and Doorways.)** The width of

corridors, passageways, hallways and doorways shall be equivalent in width to eighteen inches for every one hundred of seating capacity of such portions of building as will be required to use same for exit. No corridor, passageway or hallway shall be less than five feet in width, and no doorway less than three feet in width, except where two or more doors, each two feet eight inches or more in width, are grouped together.

500. **Doors to Open Outward—Covering of.)** All doors in such buildings shall open outward, and all entrance and exit doors shall be unlocked at all times when the building is occupied for school purposes, or open to the public. All exit doors from assembly halls to other parts of the building shall be covered with metal or other fireproof material approved by the Commissioner of Buildings.

501. **Aisles—Width of—In Assembly Halls and Recitation and Study Rooms Must Be Kept Clear of Obstructions.)** (a) Aisles in Assembly halls in such buildings shall be equivalent in width to eighteen inches for every one hundred of seating capacity in such assembly hall, but no such aisle shall be less than two feet six inches wide in its narrowest part. All groups of seats shall be so arranged that they shall have an aisle on each side, and not more than twelve seats in any one row shall be placed between aisles.

(b) Aisles in class rooms, recitation rooms and study rooms of such buildings shall be equivalent in width to eighteen inches for every one hundred permanent seats in any such room, but no aisle shall be less than sixteen inches in width and no main to cross aisle be less than two feet six inches in width.

(c) All aisles and passageways in such buildings shall be kept free from campstools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any such aisle or passageway during any performance, service, exhibition, lecture, concert or any public assemblage.

502. **Emergency Exits for Assembly Rooms—Aggregate Width of.)** All assembly halls of such buildings having a seating capacity of eight hundred or more shall be provided with at least two emergency exits. The aggregate width of such emergency exits, which shall be provided for each floor, balcony or gallery of such assembly hall, shall be not less than nine inches in width for every one hundred of seating capacity or portion thereof. No emergency exit or stairway shall be less than three feet in width. Emergency exits must be located as far apart and as far from main exits as practicable, subject to the approval of the Commissioner of Buildings.

503. **Exits — Signs.)** All exits opening from assembly halls of such buildings shall have the word "EXIT", in letters at least six inches high, applied to the auditorium side of every such exit, and when such assembly hall is in use at night, a red light shall be kept burning over the word "EXIT" during the entire time and until the pupils and audience have left the building.

504. **Lights in Buildings—Windows—Skylights.)** (a) Every portion of any such building devoted to the uses or accommodation of the public and all outlets therefrom leading to the streets, including the open courts and corridors, stairways, and exits, shall be well and properly lighted during the entire time such portion is in use, and shall remain lighted until all the pupils and the audience have left the premises.

(b) All gas or electric lights in the class rooms of main building and in halls, corridors, lobbies, stairs and exits leading from the assembly halls shall be independent of lights in assembly hall. By "independent" shall be construed a separate pipe from meter or separate circuits from switchboard.

(c) The total glass area of outside windows and skylights of each class room, recitation room or study room in such buildings shall be not less than one-fifth of the floor area of such room.

(d) Class rooms, recitation rooms and study rooms that have exterior windows on one side only must have the top of glass in such windows at a height above the floor of such room of not less than one-half of the distance to the opposite parallel wall or partition.

(e) Such rooms having exterior windows on two opposite sides of the room shall have the top of glass in such windows not less than one-fourth the distance between walls in which the windows are placed. The height of windows in corner rooms having windows in adjacent walls shall be computed from nearest wall or partition to opposite window.

(f) Where skylights or skylights and windows of sufficient size to give the proper glass area are used these heights of windows shall not be required.

505. **Scenery—Sliding Curtains—Screens—Fireproofing Same—Hand Pumps—Fire Extinguishers.)** No curtains or scenery shall be used in any assembly hall, excepting only, that it shall be permissible to use a pair of sliding curtains hung on horizontal metal rods not over twelve feet above the floor of stage and portable screens set on the floor and not over eight feet high. Screens used exclusively for stereopticon purposes shall not be construed as curtain or scenery. All screens, curtains, draperies and scenery so used shall be treated with a fire-retarding solution, and at least one hand pump or chemical fire extinguisher shall be provided and kept in such assembly hall. The use of gas calcium lights is prohibited.

506. **Basement When Used for Class Rooms.)** (a) In every such building in which the lower or basement floor is below the surface of the ground surrounding such building, and is used in part or as a whole for heating or ventilating apparatus, such floor shall be considered the basement story of such building.

(b) Class rooms, recitation rooms or study rooms shall not be allowed in basements less than twelve feet in height in the clear nor where the floor is more than two feet below the level of the sidewalk at nearest entrance of building nor in basements which are not properly lighted by windows or skylights as defined elsewhere in this Chapter for such rooms.

507. **Stories—Height of.)** No story above the basement shall be less than twelve feet in height in the clear.

508. **Fire Escapes.)** (a) Every building used for the purposes of Class VIII of three or more stories in height shall be provided and equipped with stairway fire escapes or sliding fire escapes as herein provided:

(b) All such buildings having a seating capacity of less than two hundred on any one floor above the second floor shall have at least one such fire escape.

(c) All such buildings having a seating capacity of over two hundred but less than four hundred in any one story above the second floor shall have at least two such fire escapes.

(d) All such buildings having a seating capacity of more than four hundred but less than six hundred on any floor above

the second floor shall have at least three such fire escapes.

(e) At least one additional stairway or sliding fire escape shall be provided for every increase of two hundred seating capacity in any one story above the second floor.

(f) Stairway fire escapes shall be built in accordance with the requirements of Sections 669, 670 and 673, and shall be subject to the approval of the Commissioner of Buildings.

(g) Sliding fire escapes shall be securely anchored or fastened to the building and shall have a radius or width of not less than thirty-six inches, and the inner side of the same shall be entirely smooth and made of metal. There shall be an entrance to each sliding fire escape from each floor above the first story. They shall be of a pitch of not less than thirty degrees nor more than forty-five degrees for straight runs. They shall be so constructed that they will discharge people not more than twenty-four inches from the adjacent ground or floor. They shall be of such pattern and design as will best secure the safety of the public, and their construction, location and maintenance shall be subject to the approval of the Commissioner of Buildings. Spiral sliding fire escapes shall have two complete turns for each story height of more than thirteen or less than sixteen feet.

(h) All the provisions of this Chapter relating to outside sliding or stair fire escapes shall apply to buildings of Class VIII, unless such buildings are fireproof, in which case interior fire escapes from ground to roof may be substituted for exterior fire escapes, provided such interior fire escapes shall comply with each and all of the following conditions:

(i) Interior fire escapes in fireproof buildings shall be enclosed in brick or concrete walls on all sides from top to bottom, and shall be enclosed at the top with a fireproof penthouse. The treads and risers of such interior fire escapes shall be the same as those used for stairs elsewhere in the building and the width of such fire escapes shall not be less than forty inches in their narrowest part between hand rails.

(j) The landings of such fire escapes shall, exclusive of and in addition to the space covered or occupied by swinging doors, be at least equal to the stairs in width. All doors leading to such fire escapes shall be incombustible doors and the glass portion thereof shall be glazed with polished wired glass not less than one-quarter of an inch thick, which shall be large enough to enable persons to see other persons on the opposite side of the door. The combined width of said doors on each landing shall exceed the stair width twenty-five per cent, but no single door shall be more than three feet wide. They shall be hinged and equipped with automatic opening and closing devices and shall open outward. Windows lighting such fire escapes shall have metal frames and sash and wired glass.

(k) The number and capacity of such interior fire escapes shall in no case be less than is elsewhere in this Chapter required for outside fire escapes, and the locations of the same shall be as far apart as practicable and so placed as to best secure the safety of the persons using the same in case of fire, accident or panic.

(l) Such interior fire escapes which comply with all the conditions above enumerated may be used daily as ordinary stairs.

509. **Inspection—Duties of Engineer—President of Board to Report to Fire Marshal.)** (a) It shall be the duty of the engineer of every building used for the purposes of Class VIII under the control of the Board of Education of this city, where an engineer is employed, or, in case no engineer is employed at such building, it shall then be the duty of the janitor of such building to examine all fire escapes on such buildings from the topmost story to the ground and to examine and operate all doors, windows and platforms leading to and from such fire escapes at least once each and every week that such building is used for school purposes, and to make a written report of such examination to the President of the Board of Education, showing the time it was made and the condition of the fire escapes.

(b) It shall be the duty of the President of the Board of Education to make a written report to the Fire Marshal at least three times a year, showing all such examinations made and the condition in which all fire escapes were found at the time of inspection; also the condition of the doors, windows and platforms leading to and from such fire escapes.

(c) It shall be the duty of the person in charge of each building used for the purposes of Class VIII, other than school buildings under the control of the Board of Education of this city, to make an examination of the fire escapes on school buildings under their charge, from the topmost story to the ground, and to examine and operate all doors, windows, and platforms leading to or from such fire escapes at least once each and every week that such building is used for school purposes, and to make a written report to the Fire Marshal at least three times each year, showing all such inspections made and the condition in which fire escapes, doors, windows and platforms were found at the time of the inspection.

(d) Such fire escapes shall be kept in good condition, ready for immediate use at any and all times that such building is in use and shall be kept free from snow and ice.

(e) The duties herein imposed by this Section shall not be held to relieve the Fire Marshal or Commissioner of Buildings from performing such duties as are otherwise required of them by this Chapter.

510. **Fire Drill—Written Report to Fire Marshal.)** (a) The principal or other person in charge of the pupils of every building used for the purposes of Class VIII shall establish and maintain a good and efficient fire drill, which shall be practiced at least twice every month during the time such building is used for school purposes.

(b) A written report shall be made by the principal or other person in charge of the pupils in all school buildings under the control of the Board of Education of this city to the President of said Board of Education of each fire drill held and of the time that elapsed from the first fire signal until the last person was out of the building.

(c) It shall be the duty of the President of the Board of Education to make a written report to the Fire Marshal at least three times each year, which report shall contain a record of all such fire drills practiced in each of the school buildings under the control of the Board of Education of the city.

(d) It shall be the duty of the principal or other person in charge of school-buildings, other than those under the control of the Board of Education, to make a written report to the Fire Marshal at least three times each year, showing a record of each fire drill held and the time that elapsed from the first signal until the last person was out of the building.

(e) The duties herein imposed in this Section shall not be held to relieve the Fire Marshal or Commissioner of Buildings from performing such duties as are otherwise required of them by this Chapter.

511. **The Commissioner of Buildings, the Fire Marshal, City Electrician and Superin-**

tendent of Police Shall Close Buildings for Violations.) The Commissioner of Buildings, Fire Marshal, City Electrician and Superintendent of Police, or any of them, shall have the power to close or order closed any building used wholly or in part for the purposes of Class VIII wherein there is any violation of the provisions of this ordinance, and to keep the same closed until such provisions are complied with.

ARTICLE XII.

General Provisions.

512. **Construction or Alteration of Building — Requirements.)** Every building or structure or part thereof, hereafter constructed, erected, altered, enlarged, repaired or changed within the City shall be so constructed, erected, altered, enlarged, repaired or changed, in accordance with the provisions of this Chapter.

513. **Class of Buildings Not to Be Changed Without Conforming to Provisions of This Chapter.)** If buildings, the uses of which bring them within any of the classes mentioned in this Chapter, are to be applied to the uses of any other class for which a better system of construction is required by this Chapter, the construction and equipment of such buildings shall first be made to conform to the requirements of this Chapter as specified for their intended use. And it shall be unlawful to use any such building for a new or different purpose from that to which its structure and equipment adapts it under this Chapter, unless the requirements of this Chapter for such new or different use shall first have been complied with, and a permit for such alteration or use shall have been first obtained from the Commissioner of Buildings.

514. **Alterations of Existing Buildings.)** (a) In construing the several sections of this Chapter, said sections shall not be construed as requiring alterations in the construction or equipment of buildings or structures in existence at the time of the passage of this Chapter, except where specifically provided, unless such buildings shall not have sufficient or adequate means of egress therefrom or ingress thereto, by reason of insufficient or inadequate stairways or stairways improperly located or insufficient or inadequate elevators or elevator equipment, doors, fire escapes, windows or other means of egress or ingress and except also in sections which are herein made retroactive.

(b) Whenever an Inspector of Buildings shall make a report to the Commissioner of Buildings that any such building has inadequate or insufficient means of egress therefrom or ingress thereto, as aforesaid, the Commissioner of Buildings shall notify the owner, agent, or person in possession, charge or control of such building of such fact and direct him forthwith to make such alterations and changes in the construction or equipment of such building as are necessary to be made in order to make such building comply with the requirements of this Chapter.

(c) If, however, it is desired to enlarge, or in any manner materially modify the construction of any existing building, or to make a change in its use or occupation which will transfer it from one class as recognized by this Chapter to another class, then, before such enlargement or structural change or modification of building is made, or before such change in its use or occupation may be made, written notice shall be given to the Commissioner of Buildings of the intention to change the character of the use, and the entire building shall be reconstructed or modified in such manner as to bring the same, when enlarged or altered, or when occupied for its new and different purposes, into compliance with the provisions of this Chapter.

515. **Removal of Brick, Stone or Concrete Building.)** It shall be unlawful for any person, firm or corporation to move any brick, stone or concrete building from one location to another unless the same shall be altered or reconstructed so as to conform to the ordinances governing the construction of such a building at the time of moving the same and in its new location.

516. **Live and Dead Loads—Wind Resistance.)** (a) The "dead load" shall include all permanent portions of the building, also partitions and permanent fixtures and mechanisms supported by the building.

(b) All buildings shall be designed to resist a horizontal wind pressure of 20 lbs. per square foot for every square foot of exposed surface. In no case shall the overturning moment due to wind pressure exceed seventy-five per cent of the moment of stability of the building due to the dead load only.

(c) The "live" loads per square foot of floor areas, except stairs, for the classes of buildings except portions of Class VIII as hereinafter provided shall be not less than the following:

	Pounds.
Class I	100
Class II	50
Class III	40
Class IV	100
Class V	100
Class VI	40
Class VII	100
Class VIII	75

(d) Provided, however, that in Class VIII the portions of the building exclusive of the floors in assembly halls, the corridors and the stairs, shall not be required to be constructed to support a live load in excess of 40 pounds per square foot.

(e) The roofs of all buildings shall be designed and constructed in such a manner that they will bear a load in addition to the weight of their structure and covering, of at least twenty-five pounds for each square foot of horizontal surface.

(f) The live loads on stairways for buildings of all classes shall not be less than 100 pounds per square foot of treads and landings.

517. **Structural Details—Strength Tests—How Made.)** (a) All structural details and workmanship shall be in accordance with accepted engineering practice, and subject to the approval of the Commissioner of Buildings.

(b) Floors, joists and beams shall be designed for the full dead and live loads. Floor girders shall be designed for the full dead and not less than eighty-five per cent of the live load.

(c) In buildings of every class except Class III and frame buildings, intermediate supports for joists shall be either brick, or concrete, or iron, or steel columns, beams, trusses, or girders.

(d) If brick walls are used for this purpose, they may, in all cases where the thickness of walls is given, in Section 519, as 16 inches or more, be made four inches less in thickness than the dimensions stated.

(e) Tests shall be made by the owner, upon the demand of the Commissioner of Buildings, on all forms of floor construction involving spans over eight feet. Such tests shall be made to the approval of the Commissioner of Buildings, and must show that the construction will sustain a load equal to twice the sum of the live and dead loads, for which it was designed, without any indication of failure. The construction may be considered as part of the test load. Each test load shall remain in place at least twenty-four hours. On arch construction,

this test load shall be placed on one-half of the arch, covering the area from the support to the crown of the arch.

518. **Walls, Piers and Columns—Dead and Live Loads.)** (a) The full live load on roofs of all buildings shall be taken on walls, piers, and columns.

(b) The walls, piers and columns of all buildings shall be designed to carry the full dead loads and not less than the proportion of the live load given in the following table:

Floor	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
17	85	per	cent.														
16	80	85															
15	75	80	85														
14	70	75	80	85													
13	65	70	75	80	85												
12	60	65	70	75	80	85											
11	55	60	65	70	75	80	85										
10	50	55	60	65	70	75	80	85									
9	50	50	55	60	65	70	75	80	85								
8	50	50	50	55	60	65	70	75	80	85							
7	50	50	50	50	55	60	65	70	75	80	85						
6	50	50	50	50	50	55	60	65	70	75	80	85					
5	50	50	50	50	50	50	55	60	65	70	75	80	85				
4	50	50	50	50	50	50	50	55	60	65	70	75	80	85			
3	50	50	50	50	50	50	50	50	55	60	65	70	75	80	85		
2	50	50	50	50	50	50	50	50	50	55	60	65	70	75	80	85	
1	50	50	50	50	50	50	50	50	50	50	55	60	65	70	75	80	85

(c) The proportion of the live load on walls, piers, and columns on buildings more than seventeen stories in height shall be taken in same ratio as the above table.

(d) The entire dead load and the percentage of live load on basement columns piers and walls shall be taken in determining the stress in foundations.

(e) In addition to the entire dead loads, not less than the following proportion of the percentage of live load on the basement columns, piers and walls shall be taken in determining the number of piles for pile foundations and the area of concrete caissons.

Classes I and VII..... 75 per cent.
Classes II, III and VI..... 50 per cent.
Classes IV, V and VIII..... 25 per cent.

In all foundations eccentric loading must be provided for.

519. **Thickness of Walls and Columns—Construction—Width—Height.)** (a) Brick, stone, and solid concrete walls, except as otherwise provided, shall be of the thickness in inches indicated in the following table:

	Basement.	Stories											
		1	2	3	4	5	6	7	8	9	10	11	12
One-story	12	12											
Two-story	16	12	12										
Three-Story	16	16	12	12									
Four-story	20	20	16	16	12								
Five-story	24	20	20	16	16	16							
Six-story	24	20	20	20	16	16	16						
Seven-story	24	20	20	20	20	16	16	16					
Eight-story	24	24	24	20	20	20	16	16	16				
Nine-story	28	24	24	24	20	20	20	16	16	16			
Ten-story	28	28	28	24	24	24	20	20	20	16	16		
Eleven-story	28	28	28	24	24	24	20	20	20	16	16	16	
Twelve-story	32	28	28	28	24	24	24	20	20	20	16	16	16

(b) In Class VIII buildings the thickness of surrounding walls and of all dividing walls carrying loads of floors and roof shall be as indicated in the following table, to-wit:

	Basement.	Stories				
		1	2	3	4	5
	In.	In.	In.	In.	In.	In.
One story	16	12				
Two stories	16	16	12			
Three stories	16	16	16	12		
Four stories	20	20	16	16	12	
Five stories	24	20	20	16	16	16

(c) In Class VIII buildings, walls around stairs, elevators and air shafts and joist supports shall comply with the requirements of Section 641 of this Chapter.

(d) The basement walls of two-story buildings and the first story walls of three-story buildings in Classes III and VI may be twelve inches in thickness. The first story walls of one-story buildings and the second story walls of two-story buildings in Classes III and VI may be eight inches in thickness, provided that where a pressed brick face is used no wall shall be less than twelve inches in thickness, and an eight-inch brick or solid concrete partition wall may be built in a building of any class, but in no case shall any eight-inch brick wall be more than fourteen feet in height.

(e) The basement walls of two-story buildings in Classes II, III and VI may be 12 inches in thickness.

(f) In buildings of skeleton fireproof construction, the thickness of walls shall be governed by Section 623 of this Chapter.

(g) Walls less than fifty feet in length and walls less than fifty feet between cross walls, may be built four inches less in thickness than the thickness given in the aforesaid table, but no such wall in such buildings shall be less than twelve inches in thickness, provided, however, that such walls in buildings of Classes III and VI may be sixty-five feet in length; and further provided, that eight-inch walls may be used in one-story brick buildings and in the second story of two-story brick buildings of said last mentioned classes where said eight-inch walls are not more than fourteen feet in height and are supported by a foundation or wall not less than twelve inches in thickness.

(h) A brick wall not more than twenty-five feet long and forming one side of a brick shaft for stair, elevator or other purposes, need not exceed sixteen inches in thickness. nor its upper fifty feet twelve inches in thickness, provided that in no case shall the load on such brick wall exceed the safe load for brickwork prescribed by this ordinance.

(i) The length of a wall shall be the distance in which the walls extends in a straight line and shall be measured between angles of the masonry or between exterior and cross walls.

(j) Where masonry buttresses or piers or pilasters are employed on either or both sides of a wall, then said walls may be reduced in thickness by one-half of the pro-

jection or projections of the buttresses or piers or pilasters. The reduction in thickness may be made throughout the height of the wall, except that no 12-inch wall shall be higher than thirty feet and no 16-inch wall shall be higher than fifty feet. The stress in the brick work in any part of such walls shall not exceed the stress per square inch allowed by this Chapter on the kind of masonry employed. Buttresses or piers or pilasters shall be at least one-tenth as wide as the spacing between the buttresses or piers or pilasters. Twelve-inch walls or less between buttresses or piers or pilasters shall not be used where the distance between buttresses or piers or pilasters is greater than eighteen feet. Sixteen-inch walls or less shall not be used between buttresses or piers or pilasters where the distance is greater than twenty-four feet between buttresses or pilasters. Twenty-inch walls or less shall not be used between buttresses or piers or pilasters where the distance is greater than thirty feet between buttresses or piers or pilasters.

(k) Where buttresses are used, they shall be so placed that the principal girders and trusses shall bear on them.

(l) If the loads carried by trusses and girders are supported by iron, steel, or reinforced concrete columns, then such buttresses as are herein described shall not be required except for the fireproofing of steel and iron columns. The walls between such columns shall be built as required by this Chapter, and said walls shall be anchored to such columns by metal anchors in every seven feet to the height of such column.

(m) A structural floor system shall extend from one wall to an opposite wall, and the walls shall be anchored to floor joists or girders or both with iron anchors placed opposite one another, secured to the same joists or girders in pairs, every seven feet or less of length of said walls. Where said joists or girders are of such length that it is not practicable to make them of one piece, then the several pieces shall be joined at each splice or joint by the tie plates or tie bars or other metal connections of the same strength as the anchors. Such anchors shall have not less than four-tenths of a square inch of metal in its smallest cross-sectional area. The spikes, bolts or screws, securing said anchors and tie plates, shall be of such number and size as to transmit the tensile strain which the anchor is capable of resisting into the joists or girders to which said anchors are connected. All pin anchors shall extend at least eight inches into the supporting masonry.

(n) The story height of buildings shall be the distance between structural floor systems or between such structural floor systems and structural roof systems and shall be as follows:

Where 12-inch walls are used, the story height shall not exceed 18 feet.

Where 16-inch walls are used, the story height shall not exceed 24 feet.

Where 20-inch walls are used, the story height shall not exceed 30 feet.

(o) Where the story height is greater than thirty feet, the walls shall not be of less thickness than the following: The upper fifteen feet shall be not less than sixteen inches in thickness, and the walls shall be increased four inches in thickness at each interval of fifteen feet or fractional part thereof of height.

(p) Curtain walls in skeleton construction buildings may be of hollow clay tile of the same thickness as herein required for brick walls.

(q) The walls of buildings to be used for the purposes of Classes III and VI and not more than two stories in height may be of hollow clay tile or moulded hollow concrete blocks not thinner than the thickness herein required for brick walls, subject to the approval of the Commissioner of Buildings.

520. **Ledges — Joist Supports.)** (a) In buildings two stories or more in height wherever party walls or partition walls twelve inches or less in thickness are used for the support of wood joists in buildings of Classes I, II, IV, V, VII and VIII the joists shall be supported on ledges of brick formed by corbeling not less than four courses of brick and the upper course shall project four inches beyond the face of the wall, and the joists shall be protected from the bottom to the top of same for the distance of the projection of the corbel by solid brick work laid in mortar.

(b) Wherever iron or steel joist and girder boxes having five complete sides of iron, nowhere less than ¼-inch in thickness, are used, corbels and ledges as herein specified may be omitted.

(c) In buildings of every class where wood furring is used on brick walls, the brick between joists shall be projected from the bottom of the joist to the top of the joist for the full thickness of the furring and in no case shall such projection be less than two inches.

521. **Walls of Altered Buildings—Increasing Thickness of.)** If the walls of a building are not of sufficient thickness to comply with the requirements of this Chapter for an enlarged or modified building, then the thickness of the existing walls shall be increased by building alongside of them a new wall, which shall not, however, be less in any part thereof than twelve inches thick, and which shall be increased in thickness by four inches for at least every forty feet in the height of such wall. Such new wall shall be laid in Portland cement mortar and shall be anchored to the old wall, but bonding with brick or masonry will not be considered as complying with this Chapter; and if an increase in the height of the building is contemplated, the wall from the top of the old wall shall be built jointly upon the new and old walls. If solid masonry buttresses are introduced in connection with such thickening and strengthening of existing walls, the intervening wall may be reduced to eight inches in thickness, provided such buttresses are sufficient in number and in area to make the resultant structure of equal strength with the solid wall already specified. Provided, however, that steel or iron columns or beams may be used instead of such new wall, such columns or beams to be bolted or bonded to the existing wall in a manner satisfactory to and approved by the Commissioner of Buildings.

522. **Walls—Party.)** The provisions of the preceding section shall also apply to all cases where existing party walls are to be joined to for the erection of new buildings. But in the case of party walls, which at the time of their erection were built in accordance with the terms of the city ordinances then in force, such walls, if sound and in good condition, may be used without increase of thickness for any building not higher than and of the same class as the building for which the original wall was built.

523. **Walls—Erection of—Walls and Skeleton Framework Securely Braced.)** In the erection of buildings of masonry construction, no wall shall be carried up at any time more than two stories above another wall of the same building. The walls and skeleton framework of all buildings shall be kept securely braced and otherwise protected against the effects of the weather during all building operations.

524. **Parapet Walls—When Required on Walls and Porches—Thickness and Height of.)** (a) On all flat roof buildings parapet walls shall be erected, except as hereinafter

provided, on all exterior walls and on all partition walls required by this ordinance by reason of the area of such buildings; provided, that such parapet walls may be dispensed with on any wall of a fireproof building, and on street and alley walls and on yard and court walls of buildings of other types where the entire framing and materials of the roof are strictly fireproof or where all portions of the roof nearer than fifteen feet to the lot line of such street or alley or bounding such yard or court are protected against fire by a continuous covering of porus or hollow tiles, not less than two inches thick and surfaced with mortar, on top of the roof boards.

(b) Such parapet walls may be eight inches thick wherever this ordinance permits the use of eight-inch walls; elsewhere they shall be not less than twelve inches in thickness.

(c) Such parapet walls shall extend at any point not less than three feet vertically above the roof on all such required partition walls and on all other walls within less than three feet of any division lot line and approximately parallel therewith; elsewhere they shall extend not less than eighteen inches above the roof.

(d) On all buildings whose roofs have a greater pitch than three inches per horizontal foot, parapet walls, of thickness and height as above specified, shall be erected on required partition walls, on exterior walls approximately parallel with and less than three feet distant from a division lot line, and on walls abutting on another building. Provided, that such parapet walls may be dispensed with where the entire framing and materials of the roof are fireproof or where the cornice and roof covering are of incombustible material and the top of the roof boards is protected against fire for at least five feet up from such wall by a coating of plaster on porus or hollow tiles at least two inches thick; and further provided that such parapet walls and such protection against fire may be dispensed with on buildings of Classes III and VI, three stories or less in height when such buildings have cornices of incombustible material and roof coverings of slate or terra cotta roofing tile.

525. **Allowable Stresses and Special Requirements for Foundations—Bearing on Various Soils.)** (a) If the soil is a layer of pure clay at least fifteen feet thick, without admixture of any foreign substance other than gravel, it shall not be loaded to exceed 3,500 pounds per square foot. If the soil is a layer of pure clay at least fifteen feet thick and is dry and thoroughly compressed, it may be loaded not to exceed 4,500 pounds per square foot.

(b) If the soil is a layer of firm sand fifteen feet or more in thickness, and without admixture of clay, loam or other foreign substance, it shall not be loaded to exceed 5,000 pounds per square foot.

(c) If the soil is a mixture of clay and sand, it shall not be loaded to exceed 3,000 pounds per square foot.

526. **Foundations in Wet Soil—Trenches to Be Drained.)** In all cases where foundations are built in wet soil, it shall be unlawful to build the same unless trenches in which the work is being executed are kept free from water by bailing, pumping, or otherwise, until after the completion of work upon the foundations and until all cement has properly set. In all cases a connection with the street sewer shall be established before beginning the work of laying foundations.

527. **Foundations—Where not Permitted—Depth Below Surface—Independent of Underground Construction Owned or Controlled by the City.)** (a) Foundations shall not be laid on filled or made ground or on loam, or on any soil containing admixture of organic matter, and must rest on hard, sound soil. Foundations shall in all cases extend at least four feet below the finished surface of the ground upon which they are built, unless footings rest on bed rock.

(b) Foundations shall in all cases extend at least four feet below the surface of the ground upon which they are built, and in the case of all buildings forty feet or more in height, foundations shall extend at least to the depth drained by the street sewer in the adjacent streets or alleys; but if such sewers are at a greater depth than ten feet below the sidewalk grade, such foundations need not extend to a greater depth than ten feet, provided that sound, hard soil is found at that depth.

(c) Every building forty feet or more in height, hereafter erected, which is located adjacent to any street or alley containing any then existing water main, water tunnel, sewer, conduit, tunnel, subway or other underground construction, owned or controlled by the City, shall be so constructed that the foundation or superstructure thereof shall not be supported in whole or in part by any such underground construction.

**As amended Nov. 19, 1910.*

528. **Foundation Construction.)** Foundations shall be constructed of stone, gravel or slag concrete, dimension stone or rubble stone, sewer or paving bricks, iron or steel imbedded in concrete or piles, or a combination of any of the same. All masonry foundations shall be laid in cement mortar.

529. **Foundation of New and Old Walls.)** In all cases where there is an increase in the thickness of walls, a new foundation shall be built in such a manner as to carry jointly both the new and old walls, and the soil under such foundations shall not be loaded beyond the limits specified in this Chapter.

All foundations shall be protected against the effects of frost, and cement mortar which has been affected by frost, shall not be used in building operations.

530. **Foundations—Pile Borings Required—Safe Load Required—Fiber Stress.)** (a) Where pile foundations are used, the Commissioner of Buildings may require auger borings of the soil to be made to determine the position of the underlying stratum of hard clay or rock. The heads of the piles shall be protected against splitting while they are being driven. The piles shall be sawed off to a uniform level at least one foot below Chicago datum after being driven, and the heads shall be imbedded in concrete or covered with a grillage so proportioned that in the transmission of the load from the structure to the pile the stresses in the materials shall not exceed that prescribed in this Chapter. The top of timber grillage shall be at least one foot below Chicago datum.

(b) The center of gravity of a pile foundation shall coincide with the center of gravity line of the load or loads which it carries.

(c) No pile of less than six inches diameter at small end shall be used.

(d) The safe load on a pile shall be determined by and shall not exceed the following formula:

$$P=\frac{2wh}{S+\frac{1}{10}} \text{ for steam hammer;}$$

$$P=\frac{2wh}{S+1} \text{ for drop hammer;}$$

In which formula
S=set in inches.
h=fall in feet.

w=weight of hammer.
P=safe load in pounds.

(e) The maximum load on a timber pile shall not exceed 50,000 pounds.

(f) A wood follower shall not be used in determining the safe load.

(g) Plans for pile foundations shall be submitted to the Commissioner of Buildings for approval and shall specify the least diameter of small end of piles, and no piles with smaller diameter of points than that specified for the job shall be used.

(h) There shall not be less than two rows of piles under all external party walls or other walls less than seventy feet high, and not less than three rows under all walls over seventy feet high, excepting under walls not exceeding fifty feet in height a single staggered row of piles may be used if other conditions of stability are complied with.

531. **Concrete Piles Allowable—Compression—Tests—How Made.** (a) Where concrete piles are used test piles shall be driven and loaded under the general direction of the Commissioner of Buildings.

(b) The allowable compression of concrete piles shall not exceed 400 pounds per square inch at a section six feet from the surface of the ground in immediate contact with the pile.

(c) These tests shall conform to the following regulations: Tests shall be made on at least two piles in different locations and as directed by the Commissioner of Buildings. Not less than three piles to be driven for each test. The pile to be loaded to be driven first, the second pile to be driven within six hours of the driving of the first, the third pile to be driven within twenty to twenty-four hours after the first. The two latter shall each be driven with centers not to exceed twice the greatest diameter of pile, from the center of the test pile.

(d) The tests shall not be started until at least ten days after the piles to be loaded are driven, except that piles that have been cast and set up before driving may be tested as soon as practicable after driving. The piles shall be loaded with twice the proposed carrying load of the piles.

(e) The settlement shall be measured daily until twenty-four hours shows no settlement.

(f) One-half of the test load shall be allowed for the carrying load, if the test shows no settlement for twenty-four hours and the total settlement has not exceeded one one-hundredths of an inch multiplied by the test load in tons.

532. **Steel Rails or Beams in Concrete.)** If steel or iron rails or beams are used as parts of foundations, they shall be entirely imbedded in concrete extending not less then four inches beyond the metal.

533. **Allowable Stresses and Special Requirements for Masonry.)** (a) Allowable stresses in pounds per square inch on plain concrete and stone masonry shall not exceed the following:

	Lbs.
Coursed rubble Portland cement mortar	200
Ordinary rubble Portland cement mortar	100
Coursed rubble lime mortar	120
Ordinary rubble lime mortar	60
First-class granite masonry, Portland cement mortar	600
First-class lime and sandstone masonry, Portland cement mortar	400
Portland cement concrete 1-2-4 mixture, machine mixed	400
Portland cement concrete 1-2-4 mixture, hand mixed	350
Portland cement concrete 1-2½-5 mixture, machine mixed	350
Portland cement concrete 1-2½-5 mixture, hand mixed	300
Portland cement concrete 1-3-6 mixture, machine mixed	300
Portland cement concrete 1-3-6 mixture, hand mixed	250
Natural cement concrete 1-2-5 mixture	150

(b) Allowable compression in pounds per square inch on brick masonry shall not exceed the following:

	Lbs.
No. 1 paving brick, 1 part Portland cement, 3 parts torpedo sand	350
No. 2 pressed brick and sewer brick, mortar same as referred to above	250
No. 3 hard common select brick, Portland cement mortar, same as referred to above	200
No. 4 hard common select brick, 1 part Portland, 1 lime, 3 sand as referred to above	175
No. 5 common brick, all grades, Portland cement mortar	175
No. 6 common brick, all grades, good lime and cement mortar	125
No. 7 common brick, all grades, natural cement mortar	150
No. 8 common brick, all grades, good lime mortar	100

(c) Brick under Nos. 1 and 2 shall not crush at less than 5,000 pounds pressure per square inch of gross area.

(d) Brick under Nos. 3 and 4 shall not crush at less than 2,300 pounds pressure per square inch of gross area.

(e) Brick under Nos. 5, 6, 7 and 8 shall not crush at less than 1,800 pounds pressure per square inch of gross area. Sand lime brick, of this crushing strength may be used where common brick is permitted.

(f) Isolated piers of concrete, brick, or masonry shall not be higher than six times their smallest dimensions unless the above unit of stresses are reduced according to the following formula:

$$P \text{ equals } C \left(1.25 \text{ minus} \frac{H}{20D}\right)$$

In which formula

P is the reduced allowed unit stress.
C is the unit stress in the above table.
H is the height of the pier in feet.
D is the least dimension of the pier in feet.

(g) No pier shall exceed in height twelve times the least dimension. Weight of pier shall be added to other loads in computing load coming on the pier.

534. **Definitions of Masonry.)** All masonry construction shall be defined as and comply with the following:

(a) Ordinary Rubble shall be defined as masonry composed of unsquared stones laid without attempting any regularity of courses or bond;

(b) Coursed Rubble shall be defined as masonry having approximately level joints; stones to be roughly shaped so as to fit approximately; joints in wall or pier to be leveled off every three (3) feet in height and to be well bonded.

(c) First Class Masonry shall be defined as masonry built of stones in regular courses, the bearing surfaces of which as well as ends, to be roughly tooled off and shall be laid with alternate headers and stretchers so as to secure perfect bond.

535. **Ashlar Facing.)** (a) Ashlar facing of masonry walls shall only be considered as part of wall for the purpose of carrying weight, when it has a minimum bond as follows:

(b) Every second course to be a bond course, this bond course to extend into the backing a distance equal to the least thickness of ashlar. In addition to such bond, each stone in all courses shall be tied to backing by two galvanized iron anchors. No ashlar shall be less than four inches thick, nor shall the height of any stones exceed five times its thickness.

536. **Soft Bricks—Where Not Permitted.)** Soft bricks shall not be used in any part of a building where exposed to the weather,

nor in external or internal piers of bearing walls.

537. **Brickwork—Bond of.)** The bond of all brickwork shall be formed by laying one course of headers for every five courses of stretchers; provided that in the case of pressed brick facing, two headers and a stretcher may be laid alternately in every sixth course or an equivalent number of full headers may be used in any other arrangement approved by the Commissioner of Buildings; and provided further, that pressed brick facing, when not counted as part of the bearing wall, may be laid with fewer or no header courses if anchored to the backing by metal ties of design, material, weight and quantity approved by the Commissioner of Buildings.

538. **Bricks—How Laid.)** All brick laid up in cement, or lime and cement mortar, shall be thoroughly drenched immediately before being laid unless laid in freezing weather. Both horizontal and vertical joints shall be filled with mortar in all kinds of brick masonry.

539. **Allowable Stresses and Special Requirements for Timber.)** The maximum allowable stresses in pounds per square inch on actual sections for timber shall be as follows:

	Extreme Fibre Stress and Tension with Grain.	Compression with Grain.	Compression across Grain.	Shear with Grain.
Douglas Fir and Long Leaf Yellow Pine	1,300	1,100	250	130
Oak	1,200	900	500	200
Short Leaf Yellow Pine	1,000	800	250	120
Norway Pine	800	700	200	80
White Pine	800	700	200	80
Hemlock	600	500	150	60

The unit stress on timber posts shall comply with the formulæ:

$$C\left(-\frac{L}{80D}\right)$$

In which formula:

C equals compressive strength of timber with the grain as given in table.

L equals length in inches.

D equals least diameter inches.

The maximum length of a timber post shall not exceed thirty diameters.

Timber columns shall not be used in buildings of greater height than twice the width of the building nor in buildings over one hundred feet in height.

540. **Quality of Timber.)** Timber used for building purposes shall be sound, well manufactured, close grained, free from wind shakes, or from dead, loose, decayed, encased or pitch knots, or knots and other defects that will materially impair its strength and durability.

541. **Maximum Allowable Stresses and Special Requirements for Metals.)** (a) The maximum allowable stresses in pounds per square inch in steel and iron shall not exceed the following:

	Rolled Steel.	Cast Steel.	Wrought Iron.	Cast Iron.
Tension on net section	16,000	16,000	12,000	
Maximum compression on gross section	14,000	14,000	10,000	10,000
Bending on extreme fibre	16,000	16,000	12,000	
Bending on extreme fibre tension				3,000
Bending on extreme fibre compression				10,000
Bending on extreme fibres of pins	25,000			
Shear: shop driven rivets and pins	12,000			
Shear: field driven rivets	10,000			
Shear on rolled steel shapes	12,000			
Shear plate girder webs; gross section	10,000			
Shear on brackets				2,000
Bearing, shop driven rivets and pins	25,000			
Bearing, field rivets	20,000			

(b) The allowable compressive stresses per square inch shall be determined by the following formulæ:

$$\text{Steel} \quad 16{,}000 - 70\frac{L}{R}$$

$$\text{Wrought iron} \quad 12{,}000 - 60\frac{L}{R}$$

$$\text{Cast iron} \quad 10{,}000 - 60\frac{L}{R}$$

In the above formulæ:

L equals length in inches.

R equals least radius of gyration in inches.

(c) In no case shall the allowable compressive stress exceed that given in paragraph (a) of this section.

(d) For steel columns filled with, and encased in concrete extending at least three inches beyond the outer edge of the steel, where the steel is calculated to carry the entire live and dead load, the allowable stress per square inch shall be determined by the following formulæ:

$$18{,}000 - 70\frac{L}{R},$$

but shall not exceed 16,000 pounds.

(e) For steel columns filled with, but not encased in, concrete the steel shall be calculated to carry the entire live and dead load. In this case the above formulæ may be used, but the allowable stress shall not exceed 14,000 pounds.

(f) Stress due to eccentric loading shall be provided for in all compressive members.

(g) The length of rolled steel compressive members shall not exceed one hundred twenty times the least radius of gyration, but the limiting length of struts for wind bracing only may be one hundred fifty times the least radius of gyration. The limiting length for cast iron columns shall be seventy times the least radius of gyration.

(h) Cast iron columns shall not be used in buildings of greater height than twice the least width, or in buildings over 100 feet high.

542. **Live and Dead Loads—Stress.)** (a) Wherever the live and dead load stresses are of opposite character, only 70 per cent of the dead load stress shall be considered as effective in counteracting the live load stress.

(b) For stresses produced by wind forces combined with those from live and dead load, the unit stress may be increased fifty per cent. over those given above; but the section shall not be less than required if wind forces be neglected.

543. **Riveting—Tension.)** (a) In proportioning tension members the diameter of

the rivet holes shall be taken one-eighth of an inch larger than the nominal diameter of the rivet.

(b) In proportioning rivets the nominal diameter of the rivet shall be used.

(c) Pin-connected riveted tension members shall have a net section through the pin-hole at least 25 per cent in excess of the net section of the body of the member and the net section back of the pin-hole, parallel with the axis of the member, shall not be less than the net section of the body of the member.

544. **Plate Girders — Flanges — Compression.)** (a) Plate girders shall be proportioned either by the moment of inertia of their net section, or by assuming that the flanges are concentrated at their centers of gravity and a unit stress used such that the extreme fibre stress does not exceed 16,000 pounds per square inch, in which case one-eighth of the gross section of the web, if properly spliced, may be used as flange section.

(b) The gross section of the compression flanges of plate girders shall not be less than the gross section of the tension flanges; nor shall the stress per square inch in the compression flange of any beam or girder of a longer length than 25 times the width exceed.

$$20{,}000 - 160\frac{L}{B}$$

In which formula
L equals unsupported distance and
B equals width of flange.

(c) The flanges of plate girders shall be connected to the web with a sufficient number of rivets to transfer the total shear at any point in a distance equal to the effective depth of the girder at that point combined with any load that is applied directly on the flanges.

(d) Webs of plate girders shall be provided with stiffeners over all bearing points, under all points of concentrated loading and elsewhere when required by good engineering practice.

Reinforced Concrete.

545. **Reinforced Concrete — Definition — Plans.)** The term "Reinforced Concrete" means any combination of metal imbedded in concrete to form a structure so that the two materials assist each other to sustain all the stresses imposed. Before a permit to erect any reinforced concrete structure is issued, complete plans and specifications shall be filed with the Commissioner of Buildings, showing all details of the construction, including detail of working joints, the size and position of all reinforced rods, stirrups or other forms of metal, and giving the composition and proportion of the concrete; provided, however, that permission to erect any reinforced concrete structure does not in any manner approve the construction until after tests have been made of the actual construction to the satisfaction of the Commissioner of Buildings.

546. **Ratio of Moduli of Elasticity—Adhesion—Bond.)** (a) The calculations for the strength of reinforced concrete shall be based on the assumed ultimate compressive strength per square inch designated by the letter "U" given in the table below for the mixture to be used.

(b) The ratio designated by the letter "R" of the modulus of elasticity of steel to that of the different grades of concrete shall be taken in accordance with the following table:

Mixture.	U	R
1 cement, 1 sand, 2 broken stone, gravel or slag	2,900	10
1 cement, 1½ sand, 3 broken stone, gravel or slag	2,400	12
1 cement, 2 sand, 4 broken stone, gravel or slag	2,000	15
1 cement, 2½ sand, 5 broken stone, gravel or slag	1,750	18
1 cement, 3 sand, 7 broken stone, gravel or slag	1,500	20

547. **Unit Stresses for Steel and Concrete.)** (a) The stresses in the concrete and the steel shall not exceed the following limits:

(b) Tensile stress in steel shall not exceed one-third of its elastic limits and shall not exceed 18,000 pounds per square inch.

(c) Shearing stress in steel shall not exceed 12,000 pounds per square inch.

(d) The compressive stress in steel shall not exceed the product of the compressive stress in the concrete multiplied by the elastic modulus of the steel and divided by the elastic modulus of the concrete.

(e) Direct compression in concrete shall be one-fifth of its ultimate strength. Bending in extreme fibre of concrete shall be thirty-five one-hundredths of the ultimate strength.

(f) Tension in concrete on diagonal plane shall be one-fiftieth of the ultimate compressive strength.

(g) For a concrete composed of one part of cement, two parts of sand and four parts of broken stone, the allowable unit stress for adhesion per square inch of surface of imbedment shall not exceed the following:

	Pounds Per Sq. Inch.
On plain round or square bars of structural steel	70
On plain round or square bars of high carbon steel	50
On plain flat bars, in which the ratio of the sides is not more than 2 to 1	50
On twisted bars when the twisting is not less than one complete twist in eight diameters	100

(h) For specially formed bars, the allowable unit stress for bond shall not exceed one-fourth of the ultimate bond strength of such bars without appreciable slip which shall be determined by tests made by the person, firm or corporation to the satisfaction of the Commissioner of Buildings, but provided that in no case shall such allowable unit stress exceed 100 pounds per square inch of the specially formed bars.

548. **Design for Slabs, Beams and Girders.)** Reinforced concrete slabs, beams and girders shall be designed in accordance with the following assumptions and requirements:

(a) The common theory of flexure shall be applied to beams and members resisting bending.

(b) The adhesion between the concrete and the steel shall be sufficient to make the two materials act together.

(c) The steel to take all the direct tensile stresses.

(d) The stress strain curve of concrete in compression is a straight line.

(e) The ratio of the moduli of elasticity of concrete to steel shall be as specified in the table in Section 546.

549. **Moments of External Forces.)** (a) Beams, girders, floor or roof slabs and joists shall be calculated as supported, or with fixed ends, or with partly fixed ends, in accordance with the actual end conditions, the number of spans and the design.

(b) When calculated for ends partly fixed for intermediate spans with an equally distributed load where the adjacent spans are of approximately equal lengths:

Bending moment at center of spans shall not be less than that expressed in the formula $\frac{WL^2}{12}$ for intermediate spans and $\frac{WL^2}{10}$ for end spans.

(c) The moment over supports shall not be less than the formula $\frac{WL^2}{18}$ and the sum of the moments over one support and at the center of span shall be taken not less than the formula $\frac{WL^2}{6}$.

In the formula hereinabove given "W" is the load per lineal foot and "L" the length of span in feet.

(d) In case of concentrated or special loads the calculations shall be based on the critical condition of loading.

(e) For fully supported slabs, the free opening plus the depth, for continuous slabs, the distance between centers of supports, is to be taken as the span.

(f) Where the vertical shear, measured on the section of a beam or girder between the centers of action of the horizontal stresses, exceeds one-fifth of the ultimate direct compressive stress per square inch, web reinforcement shall be supplied sufficient to carry the excess. The web reinforcement shall extend from top to bottom of beam, and loop or connect to the horizontal reinforcement. The horizontal reinforcement carrying the direct stresses shall not be considered as web reinforcement.

(g) In no case, however, shall the vertical shear, measured as stated above, exceed one-fifteenth of the ultimate compression strength of the concrete.

(h) For T beams the width of the stem only shall be used in calculating the above shear.

(i) When steel is used in the compression side of beams and girders, the rods shall be tied in accordance with requirements of vertical reinforced columns with stirrups connecting with the tension rods of the beams or girders.

(j) All reinforcing steel shall be accurately located in the forms and secured against displacement; and inspected by the representative of the architect or engineer in charge before any surrounding concrete be put in place. It shall be afterwards completely inclosed by the concrete, and such steel shall nowhere be nearer the surface of the concrete than 1½-inch for columns, 1½-inch for beams and girders, and ½-inch, but not less than the diameter of the bar, for slabs.

(k) The longitudinal steel in beams and girders shall be so disposed that there shall be a thickness of concrete between the separate pieces of steel of not less than one and one-half times the maximum sectional dimension of the steel.

(l) For square slabs with two-way reinforcements the bending moment at the center of the slab shall not be less than that expressed in the formula $\frac{WL^2}{24}$ for intermediate spans, and $\frac{WL^2}{20}$ for end spans.

(m) The moment over supports shall not be less than the formula $\frac{WL^2}{36}$ and the sum of the moments over one support and at the center of the span shall be taken not less than the formula $\frac{WL^2}{12}$.

In which above formula "W" is the load per lineal foot and "L" the length of the span.

(n) For squares or rectangular slabs, the distribution of the loads in the two directions, shall be inversely as the cubes of the two dimensions.

(o) Exposed metal of any kind will not be considered a factor in the strength of any part of any concrete structure, and the plaster finish applied over the metal shall not be deemed sufficient protection unless applied of sufficient thickness and so secured as to meet the approval of the Commissioner of Buildings.

550. **Limiting Width of Flange in "T" Beams.)** (a) In the calculation of ribs, a portion of the floor slab may be assumed as acting in flexure in combination with the rib. The width of the slab so acting in flexure is to be governed by the shearing resistance between rib and slab, but limited to a width equal to one-third of the span length of the ribs between supports and also limited to a width of three-quarters of the distance from center to center between ribs.

(b) No part of the slab shall be considered as a portion of the rib, unless the slab and rib are cast at the same time.

(c) Where reinforced concrete girders support reinforced concrete beams, the portion of floor slab acting as flange to the girder must be reinforced with rods near the top, at right angles to the girder, to enable it to transmit local loads directly to the girder and not through the beams.

551. **Shrinkage and Thermal Stresses.)** Shrinkage and thermal stresses shall be provided for by introduction of steel.

552. **Reinforced Concrete Columns—Limit of Length—Per Cent of Reinforcement—Bending Moment in Columns—Tying Vertical Rods.)** (a) Reinforced concrete may be used for columns in which the concrete shall not be leaner than a:1:2:4 mixture and in which the ratio of length to least side or diameter does not exceed twelve, but in no case shall the cross section of the column be less than 64 square inches. Longitudinal reinforcing rods must be tied together to effectively resist outward flexure at intervals of not more than twelve times least diameter of rod and not more than 18 inches. When compression rods are not required, reinforcing rods shall be used, equivalent to not less than one-half of one per cent (.005) of the cross sectional area of the column; provided, however, that the total sectional area of the reinforcing steel shall not be less than one square inch, and that no rod or bar be of smaller diameter or least dimensions than one-half inch. The area of reinforcing compression rods shall be limited to three per cent. of cross sectional area of the column. Vertical reinforcing rods shall extend upward or downward into the column, above or below, lapping the reinforcement above or below enough to develop the stress in rod by the allowable unit for adhesion. When beams or girders are made monolithic with or rigidly attached to reinforced concrete columns, the latter shall be designed to resist a bending moment equal to the greatest possible unbalanced moment in the beams or girders at the columns, in addition to the direct loads for which the columns are designed.

(b) When the reinforcement consists of vertical bars and spiral hooping, the concrete may be stressed to one-fourth of its ultimate strength as given in Section 546, provided, that the amount of vertical reinforcement be not less than the amount of the spiral reinforcement, nor greater than eight per cent. of the area within the hooping; that the percentage of spiral hooping be not less than one-half of one per cent. nor greater than one and one-half per cent.; that the pitch of the spiral hooping be uniform and not greater than one-tenth of the diameter of the column, nor greater than three inches; that the spiral be secured to the verticals at every intersection in such a manner as to insure the maintaining of its form and position, that the verticals be spaced so that their distance apart, measured on the circumference be not greater

han nine inches, nor one-eighth the circumerence of the column within the hooping. n such columns, the action of the hooping ıay be assumed to increase the resistance f the concrete equivalent to two and one-alf times the amount of the spiral hooping igured as vertical reinforcement. No part f the concrete outside of the hooping shall e considered as a part of the effective colmn section.

553. **Structural Steel Columns.)** When he vertical reinforcement consists of a tructural steel column of box shape, with ıttice or battenplates of such a form as to ermit its being filled with concrete, the oncrete may be stressed to one-fourth of ts ultimate strength as given in table in ection 546, provided that no shape of less han one square inch section be used and hat the spacing of the lacing or battens be ot greater than the least width of the colmns.

554. **Curtain Walls in Skeleton Construction Buildings.)** Buildings having a comlete skeleton construction of steel or of einforced concrete construction, or a comination of both, may have exterior walls of einforced concrete eight inches thick; proided, however, that such walls shall support only their own weight and that such ralls shall have steel reinforcement of not ess than three-tenths of one per cent in ach direction, vertically and horizontally, the ods spaced not more than twelve-inch ceners and wired to each other at each intersection. All bars shall be lapped for a length ufficient to develop their full stress for he allowable unit stress for adhesion. Additional bars shall be set around openings, he verticals wired to the nearest horizonal bars, and the horizontal bars at top and ottom of openings shall be wired to the earest vertical bars. The steel rods shall e combined with the concrete and placed vhere the combination will develop the reatest strength, and the rods shall be taggered or placed and secured so as to esist a pressure of thirty pounds per square oot, either from the exterior or from the nterior on each and every square foot of ach wall panel.

555. **Bending and Elongation of Steel.)** The bending and elongation of steel used n reinforced concrete construction shall onform to the following requirements: (a) teel having a diameter of three-fourths of n inch or less shall be capable of bending old ninety degrees over a diameter equal o twice the thickness of the piece without racture; steel over three-fourths inch in iameter shall be capable of bending cold to inety degrees over a diameter equal to hree times the diameter of the piece.

(b) The material of reinforcement shall e such form that it will not elongate uner working stress to exceed one fifteenundredth.

(c) Reinforcing steel used in reinforcing oncrete construction shall not be painted, ut shall be free from all mill scale and oose rust.

556. **Cement Tests.)** (a) Only Portland ement shall be used in reinforced concrete onstruction. All cement shall be tested in ar load lots when delivered, or in quantiies equal to the same. Cement failing to ieet the requirements of accelerated test hall be rejected.

(b) Pats of neat cement must be allowed o harden twenty-four hours in moist air, nd then be submitted to the accelerated est as follows: A pat is exposed in any conenient way in an atmosphere of steam, and bove boiling water, in a loosely closed vesel for three hours, after which before the at cools, it is placed in the boiling water or five additional hours. To pass this test atisfactorily, the pat shall remain firm and hard, and show no signs of cracking, distortion or disintegration.

(c) Portland cement when tested shall have a minimum tensile strength as follows: Neat cement after one day in moist air shall develop a tensile strength of at least 200 pounds per square inch; after one day in air and six days in water shall develop a tensile strength of at least 500 pounds per square inch, and after one day in air and twenty-seven days in water, shall develop a tensile strength of at least 600 pounds per square inch. Cement and sand tests composed of one part of cement and three parts of sand shall after one day in air and six days in water, develop a tensile strength of at least 175 pounds per square inch; and after one day in air and twenty-seven days in water, shall develop a tensile strength of at least 240 pounds per square inch.

(d) A certificate that the cement used has been tested and has met the requirements of this section and that the tests have been made in accordance with the standard methods prescribed by the American Society for Testing Materials, on pages 149 to 164, both inclusive, of the proceedings of the Eleventh Annual Meeting of the American Society for Testing Materials, adopted August 15, 1908, shall be furnished by the architect or engineer in charge to the Commissioner of Buildings.

557. **Sand.)** The sand to be used for concrete shall be clean, hard, coarse sand, of the grade known as torpedo sand, and free from loam or dirt, not less than 45 per centum shall be returned on a screen of 400 mesh to the square inch.

558. **Stone.)** The stone to be used in concrete shall be clean crushed hard stone or clean crushed blast furnace slag or gravel of a size to pass through a one-inch square mesh. If limestone or slag is used, it shall be screened to remove all dust; if gravel is used, it shall be thoroughly washed. Stone shall be drenched immediately before using. If slag is used, it shall be of such character that when made into concrete the concrete will develop a crushing strength equal to that specified for stone or gravel concrete.

559. **Mixing.)** All concrete shall be mixed in a mechanical mixer except when limited quantities are required, or when the conditions of the work make hand mixing preferable; hand mixing to be done only when approved by the Commissioner of Buildings. In all mixing, the separate ingredients shall be measured and shall be thoroughly mixed and must be uniform in color, appearance and consistency before placing.

560. **Placing Concrete.)** In filling in concrete around reinforcing steel, the concrete must be worked continuously with suitable tools, as it is put in place. Filling the forms completely and puddling afterward will not be permitted. In placing the concrete, the work shall be so laid out that partly set concrete will not be subjected to shocks from men wheeling or handling material over it.

561. **Concrete Placed in Freezing Weather.)** When concreting is carried on in freezing weather, the material must be heated, and such provisions made that the concrete can be put in place without freezing. The use of frozen, lumpy sand, or stone depending on hot water used in mixing to thaw it out will not be permitted. All reinforced concrete shall be kept at a temperature above freezing for at least forty-eight hours after being put in place. All forms under concrete placed in freezing weather shall remain until all evidences of frost are absent from the concrete and the natural hardening of the concrete has proceeded to the point of safety.

562. **Concrete Placed in Warm Weather.)** Concrete laid in warm weather shall be drenched with water twice daily, Sunday included, during the first week after being put in place.

563. **Cement Finish.)** Cement finish added to the top of slabs, beams, or girders, shall not be calculated in the strength of a member unless laid integrally with the rough concrete. No greater unit stress shall be allowed on such cement finish than on the rough concrete.

564. **Fireproof Concrete Construction.)** Reinforced concrete construction will be accepted for fireproof buildings if designed as prescribed in this paragraph. The aggregate for such concrete shall be clean, broken stone or clean crushed blast furnace slag, or clean screened gravel, together with clean, coarse sand of the grade known as torpedo sand; stone, slag or gravel shall be of a size to pass through a screen of three-quarter inch mesh. The minimum thickness of concrete surrounding the reinforcing members of reinforced concrete beams and girders shall be two inches on the botton, and one and one-half inches on the sides of said beams and girders. The minimum thickness of concrete under slab rods shall be one inch; and all reinforcement in columns shall have a minimum protection of two inches of concrete except as hereinafter provided, if a supplementary metal fabric is placed in the concrete surrounding the reinforcing, simply for holding the concrete, the thickness of concrete under the reinforcing may be reduced by one-half inch, then such fabric shall not be considered as reinforcing metal.

565. **Removal of Forms.)** In no case shall the props and shores used in reinforced concrete construction be removed from under floors and roofs in less than two weeks, except as is provided herein. Column forms shall not be removed in less than four days. The centering from bottom of slabs and sides of beams and girders may be removed after the concrete has set for one week, if the floor has obtained sufficient hardness to sustain the dead weight of the said floor. No load or weight shall be placed on any portion of the construction until the concrete has fully set and the centers have been removed.

566. **Tests.)** The contractor for the reinforced concrete construction shall make load tests on any portion of the work within a reasonable time after erection, as may be required by the Commissioner of Buildings. Such tests must be made under the direction of the Commissioner of Buildings in his presence or in the presence of his representative, and must show that the construction will sustain a load twice the sum of the live and dead loads for which it was designed, without any sign of failure. The construction may be considered as part of the test load. Each test load shall cover two or more panels and shall remain in place at least twenty-four hours. The deflection under the full test load at the expiration of twenty-four hours shall not exceed one eight-hundredth of the span. These tests shall be considered as tests of workmanship only.

567. **Reinforced Terra Cotta Hollow Tile.)** (a) The term reinforced hollow tile is hereby defined to mean a system of hollow burned clay tile in combination with reinforced concrete, in which combination the hollow tile may be used to resist compressive and shearing stresses subject to the following provisions:

The provisions relating to reinforced concrete construction shall hold as far as applicable to this system.

All tile to be hard burned terra cotta tile of uniform quality, free from shrinkage cracks, with true beds and having an ultimate compressive strength of not less than 4,000 pounds per square inch of net area of surface tested.

The following stresses and values shall not be exceeded: Extreme fibre stress (compressive) on hollow tile, 500 pounds per share inch.

Shearing stress on hollow tile, 200 pounds per square inch.

Adhesion between tile and 1:2:4 concrete to 1:3 cement mortar, 40 pounds per square inch.

Ratio of modulus of elasticity of steel to that of tile with cement mortar joints, 10.

(b) **Special Provisions as to Workmanship in Reinforced Hollow Tile Construction.)** The hollow tile shall be thoroughly soaked with water at the time concrete is poured and be kept drenched for at least thirty-six hours afterwards. The joints between tiles shall be staggered, buttered and slushed full of mortar consisting of one (1) part of Portland cement and three (3) parts of clean, sharp sand, thoroughly mixed.

(c) **Terra Cotta Tile Columns.)** Columns of solid terra cotta or of hollow terra cotta in which the sectional area of the open holes in each block shall not exceed twenty (20) per cent of the gross sectional area of such block, may be used for structural purposes provided the height of such column shall not exceed twelve times the least dimension.

The allowable stress shall not exceed 350 pounds per square inch and shall be subject to the reduction formula given in Section 553 in paragraph f.

All terra cotta tile used for construction of columns shall be hard burned terra cotta tile of uniform quality, free from shrinkage cracks, with true beds and having ultimate compressive strength of not less than 6,000 pounds per square inch of net area of cross section of samples tested.

Mortar used in setting terra cotta tile walls and columns to be composed of one (1) part Portland cement and three (3) parts clean, sharp sand, thoroughly mixed.

(d) **Special Provisions as to Workmanship in Tile Column Construction.)** All terra cotta tile must be thoroughly wet before using and when used in columns must be set on end with the voids running vertically and directly over each other, and with the webs in direct line of pressure.

All vertical joints must stagger and terra cotta blocks must be of proper dimensions to meet this condition as no broken tile will be allowed.

All work to be set plumb, with uniform horizontal joints, thickness to average three-eighths (3-8) of an inch. The minimum time which shall elapse between the finishing of the work and before any load is placed thereon shall be not less than seven days.

(e) **Terra Cotta Tile Walls.)** Hollow tile may be used for building primary bearing walls, which are defined as walls that may be used to receive directly the loads from floors or roofs in addition to their acting as partition walls, provided the proportion between thickness of wall and free height between the floors does not exceed fifteen (15) and the load including the weight of the construction does not exceed three hundred and fifty (350) pounds per square inch of net sectional area of tile, and shall be of the thickness specified by this chapter for brick walls. Hollow terra cotta tile may be used for exterior walls, but when so used the thickness and height of the work must conform to the dimensions required for brick walls in this chapter, but must in no case exceed four stories in height in any building. The thickness of walls shall be calculated as the outside dimensions of the tile and each tile shall be full thickness of wall. The thickness of the plastering is not to be included as a part of the thickness

of the wall. Walls having a thickness of 4 inches may be used when the height does not exceed five (5) feet. The quality of the tile and mortar and special provisions as to workmanship as specified for terra cotta columns shall apply to terra cotta tile walls.

(f) **Terra Cotta Grain Bin Construction.)** Fireproof storage bin, grain elevators and grain warehouses may be built in cylindrical form with terra cotta tile of such height, diameter and thickness as is allowed by safe engineering practices, provided that the material shall not be stressed in excess of the limits prescribed in this chapter for walls and columns.

568. **Cinder Concrete.)** (a) Cinder concrete construction may be used for all buildings in which fireproof construction is mandatory by this chapter, or where ordinary construction, mill construction or slow-burning construction may be used.

(b) Only clean, thoroughly burnt, steam boiler cinders, free from matter other than cinders may be used. The cinders used shall be of such size that they will pass through a one-inch square mesh. Cinder concrete piers or walls shall not be permitted to carry loads and shall not be given credit therefor.

(c) The ultimate compressive strength per square inch of cinder concrete shall be taken as not exceeding seven hundred pounds. The ratio of the modulus of elasticity of steel divided by the modulus of elasticity of cinder concrete shall be taken as thirty.

(d) There shall not be less than one part of Portland cement to seven parts of cinders and sand of the grade known as torpedo sand in cinder concrete. All other special requirements and methods of calculation for reinforced concrete as required in this chapter shall modify and regulate the use of cinder concrete in buildings.

(e) All steel and all metal pipe and conduits enclosed in cinder concrete shall be protected by a coating of cement grout or plastered with good lime mortar before the cinder concrete is placed.

(f) For fireproof construction, the minimum thickness of cinder concrete covering on structural metal shall be the same as required for brick or concrete covering for fireproof buildings by this chapter. In slow-burning or mill construction buildings, the minimum thickness of cinder concrete covering on structural metal shall be three inches on columns and two inches on beams, girders and other structural steel or iron members.

(g) Wherever cinder concrete is used for the covering of columns, beams, girders or other structural steel members of a building the cinder concrete covering shall have metal binders, or wire fabric, imbedded in and around said columns, beams, girders or other structural steel members. If wire is used for said metal binders, it shall not be smaller than No. 8 gauge wire and shall be spaced not less than sixteen inches apart along the length of the steel member covered.

(h) Where cinder concrete construction is used for a building which, by this chapter, is required to be of fireproof construction, all parts that carry weights or resist strains, shall be made entirely of incombustible material, and all metallic structural members shall be protected against the effects of fire by cinder concrete proportioned, mixed, applied and secured as herein described.

(i) All other parts of a building of cinder concrete construction, built where fireproof construction is mandatory by this chapter, shall be built and made of the material required by this chapter for buildings of fireproof construction; provided, however, that cinder concrete as described herein, and of the same thickness elsewhere specified, may be used for all protective covering of structural metal, after such metal has been protected by a coating of cement grout or plastered with good lime mortar, as required by this chapter.

Skeleton Construction.

569. **Skeleton Construction.)** (a) The term "Skeleton Construction" shall apply to all buildings wherein all external and internal loads and stresses are transmitted from the top of the building to the foundations by a skeleton or framework of metal or reinforced concrete.

(b) In metal frame skeleton construction the beams and girders shall be riveted to each other at their respective junction points. If columns made of rolled iron or steel are used, their different parts shall be riveted to each other, and the beams and girders shall have riveted connections to unite them with the columns. If cast iron columns are used, each successive column shall be bolted to the one below it by at least four bolts not less than ¾ inch in diameter, and the beams and girders shall be bolted to the columns. Bolt holes in flanges for connection from column to column shall be drilled. At each line of floor or roof beams, lateral connections between the ends of the beams and girders shall be made in such manner as to rigidly connect the beams and girders with each other in the direction of their length.

(c) All steel trusses shall be riveted and the steel work in buildings more than 100 feet high and in a building whose height exceeds twice its width shall be riveted.

(d) Wherever it is found impossible to rivet connections as herein described and such connections are bolted, cold rolled or turned bolts of exact fit and diameter in reamed holes may be used in place of rivets with the same allowable stresses as field driven rivets.

(e) All structural members which are temporarily bolted together shall be well bolted in every alternate hole.

(f) After the bases or base plates and columns have been set in place, both shall be protected by a covering of cement concrete applied direct to the metal, measuring not less than two and one-half inches thick from the extreme projection of the metal, filled solid into all spaces, and forming a continuous concrete mass from the grillage or other foundations to an elevation six feet above the floor level nearest the column base plate or column stool.

(g) All metal shall be clean and shall be free from loose rust and scale, and all metal except that to be embedded in concrete shall be protected with at least two coats of metal protecting paint.

(h) All structural details and workmanship shall be in accordance with accepted engineering practice.

(i) All trusses shall be held rigidly in position, both temporarily and permanently by efficient lateral and sway bracing.

Miscellaneous Provisions.

570. **Porches—Verandas—Porticos—Construction of Inside Fire Limits.)** (a) The enclosing walls of porches, verandas, or porticos shall be of incombustible material on buildings inside the fire limits, except that where such porches, verandas, or porticos constitute part of a storm house or of a storm door enclosure, they may be of combustible material, providing, that they be not more than twelve feet high, nor occupy a greater frontage than two feet more than the width of the inner doors protected by such storm enclosure.

(b) On buildings more than three stories in height, porches hereafter erected, if of combustible material, shall not exceed one

story in height. Where porches of incombustible material are continuous and extend fifty feet or more across the rear of buildings, there shall be a partition of incombustible material separating each fifty feet of porch from the adjacent porch.

571. **Tanks on Roofs—Permits—Fees.)** It shall be unlawful for any person, firm or corporation to construct, maintain or allow, or permit to remain in or upon the roof of any building in the city, any tank of a larger capacity than four hundred gallons, unless such tank shall rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron girders set on steel plates which rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron or steel construction. No tank of a capacity exceeding four hundred gallons shall be constructed in or upon any building without first submitting for the approval of the Commissioner of Buildings a complete set of plans, showing the construction in detail of the supports and foundations of such tank. If such plans shall be satisfactory to the Commissioner of Buildings, they shall be approved by him. The owner or his agent or the contractor erecting such tank shall, before proceeding with the erection of such tank, procure from the Department of Buildings a permit for the sub-structure work, for which permit a fee of five dollars shall be charged.

572. **Door and Window Openings, When Protected in Buildings of Classes I, II, IV, V, VII and VIII—Iron Doors—Wired Glass Set in Metal Frames.)** (a) Where the distance from door to window openings in buildings of Classes I, II, IV, V, VII and VIII is less than thirty (30) feet from the opposite side of the established alley line and where the windows and doors of two or more areas of the same building which is required to be separated by dividing walls by this chapter, are on a court, every such window and door, distant less than thirty feet from another window or door of another such area and where also the doors and window openings are within fifteen (15) feet of an inside lot line, such openings shall be provided with windows and doors constructed of wire glass set in metal frames and sash; provided, further, that doors may be automatic rolling steel shutters or steel plate doors or metal-clad wood doors, and further provided that at least one of the first or ground floor doors must be a sewinging door.

(b) Where iron doors are used to fulfill the requirements of this section they shall be made of sheet iron or steel, of not less than No. 14 U. S. gauge metal, and shall lap the wall at least one-half inch all around the opening, and the bottom shall fit the sill closely where it is not practicable to lap it. The frames and crossbars shall be made of one and one-half by one and one-half by one-fourth inch angles and in no case shall there be less than two crossbars, and where the doors are over six feet high, such crossbars shall be spaced not more than two feet apart. Lever bars shall be made of one and one-half by three-eighths inch iron, extending at least one-third of the distance across the opposite leaf. The number and spacing of such lever bars shall be the same as the crossbars. Where hinges are used they shall be made of two by one-fourth inch iron, extending at least three-fourths of the way across the door. The number and spacing of such hinges shall be the same as is required for the crossbars. Pin bolt or eyes shall be one-half inch round and shall be securely fastened to the building.

(c) Where metal frames and wired glass are used to fulfill the requirements of this section, the glazed portion of the frames and sash shall be set with fire-resisting glass such as is elsewhere herein defined. The unsupported area of the glass shall be in neither width nor length greater than forty-eight inches or exceed seven hundred and twenty (720) square inches in any one pane of glass. The glass must be supported by frames and sashes. The wired glass shall be retained by the structural part of the frame or sash independently of material used for waterproof purposes and only noninflammable material shall be used in setting glass in the sash. Frames shall be of such form as to be retained by the walls either with flanges of at least one inch in width or by hooks of proper length securely driven into the wall or by means of extending wings flush with the brickwork and securely spiked to the wall. Frames shall be made of galvanized iron of not less than No. 24 gauge metal, and of a quality soft enough to permit all necessary bending without breaking, or they may also be constructed of not less than 20-ounce copper, or other metal of equal strength and durability and which will not melt at a lower temperature than copper. All joints shall be made with interlocking seams. They shall be securely riveted together, and in no case, shall solder be used. Grooves and rabbets shall be at least three-quarters of an ich in depth and the actual bearing of the glass shall be at least five-eighths of an inch. The head of the frame shall be closed at the top and the piece forming this closure shall be securely fastened to each side at all points. The sill shall be filled with concrete or other incombustible material. Movable sash shall have stiles and rails of the thickness and width of at least one and three-quarters inches and shall be securely fastened together at each corner and so constructed that they will correspond in construction with the frame at the point of contact.

(d) Lifting or sliding sash shall be counterweighted so as to balance. The sash weights shall be properly separated by parting strips in the boxes containing them, and shall be accessible through the jambs of the frame. Such sash shall be provided with metallic sash chain or cable and smooth running sash pulleys securely riveted or bolted in place. The sash chain or cable shall be of sufficient strength to withstand severe heat without parting, and be thoroughly protected against moisture and corrosion. The sash shall be fitted into the frame with suitable stops and parting beads of metal. Sash shall be removable. Meeting rails of the sash shall be so constructed as to prevent the passage of heat and flame. The sash shall be equipped with one or more substantial sash locks securely riveted or bolted in place.

(e) Horizontally pivoted sash shall be riveted above the center on steel pivots at least three-eighths inch in diameter. Pivots shall work in brass eye plates securely riveted in place. Frames shall be reinforced where the pivots enter by riveting on one-eighth inch iron strips, so drilled as to receive the pivots. Such sash must be provided with suitable stops and an effective attachment for holding them open or closed. Such sash shall be provided with a substantial gravity lock or latch at top and bottom which will be positive in action. Where the lower sash is stationary or where two pivoted sash are used the transom bar dividing the upper from the lower sash shall be so constructed that it will not warp or bulge materially under heat or rapid cooling. Where rails and transom bars are used they shall be made so as not to be easily affected by rust and so as to afford ample weatherproof qualities.

(f) Vertically pivoted sash shall comply generally with the requirements for horizontally pivoted sash. If the entire window is pivoted in one sash, such sash must be constructed in such manner as to afford

stiffness, and in such manner as to prevent warping under heat.

(g) Hinge sash or casement windows must be hinged with heavy brass hinges and a substantial brass latch or lock securely bolted in place. Such sash shall be constructed so as to fit the frame closely and afford ample weatherproof qualities at all points. They shall be provided with stops and fastenings necessary to prevent warping under heat.

(h) Where the area of wall openings is in excess of 5 by 9 feet, the metal frames containing the sash or glass must be reinforced at every point of division by not less than five-inch "I" beams securely fastened into the brickwork, proper allowance being made for expansion of the beams when heated. "I" beams shall be protected on the flanges with at least two inches of tile, concrete, or other material approved by the Commissioner of Buildings, and next to the web with at least two and one-half inches of such material, which thickness shall be increased on large beams. Metal frames shall be securely attached to the reinforcing members.

(i) Electro-glazed prism glass may be used in lieu of wired glass, when approved by the Commissioner of Buildings as to material and construction of same, providing the frames and sash of same comply with the requirements of this section for wired glass window frames and sash.

(j) This section shall not apply to frame buildings nor to buildings outside the fire limits twenty-eight hundred square feet or less in area, nor to buildings of Class I, one story in height, nor to buildings of Class II not more than two stories in height, nor to store windows in the first story, where the same are located on an alley and not more than sixteen feet from the street.

573. **Dividing Walls and Iron Doors—Openings Inserted.)** (a) Wherever openings are to be inserted in dividing walls, as before described, or in dividing walls between non-fireproof and fireproof buildings, or parts of either of such buildings, they shall be made as follows:

(b) Such doors may be either sliding doors or swinging doors, and shall be so constructed, installed and maintained that they can be easily opened or closed from either side at all times by any person; provided, however, rolling steel shutters may be used when such openings are not used as exits.

(c) Every such door shall be equipped with a device containing a fusible link or other releasing arrangement of equal efficiency, approved by the Commissioner of Buildings. There shall be one of these immediately above the door opening and one above the opening near the ceiling. Where the ceiling is less than three feet above the door opening, the last mentioned fusible link or releasing device may be omitted, if the doors are so arranged that the operation of any one of the thermostats, or other releasing devices, will result in the closing of the doors on both sides of the walls. Fusible links, or other approved substitute, shall be made so that they will fuse or operate when subjected to a heat of 160 to 165 degrees Fahrenheit. If said doors are of steel plate, the plate or plates shall be of No. 12 U. S. gauge or greater thickness, with a continuous two by two by three-eighths inch angle iron frame extending all around the same and two by two by three-eighths inch panel bars not exceeding twenty-four inches apart, riveted to the plate of the door with not less than three-eighths inch rivets spaced four inches to six inches between centers. Pairs of swinging doors shall be so constructed that when the doors are closed, they will be of strength equal to that of a single door, and shall be so arranged that they will operate automatically. All doors shall be hung on wall frames of four by three by three-eighths inch angle iron or of four by three-eighths inch bar iron stiffened by one and one-half by one and one-half by one-fourth inch angles riveted on the back and fitting snugly to the wall. The frame shall be fastened together by three-fourths inch bolts extending through the wall, such bolts being not more than two feet apart. All doors to be made to fit closely to the wall frame on all sides. Lintels of door openings shall be made of brick, iron or concrete.

(d) Swinging iron doors shall swing on three wrought iron hinges made of two by three-eighths inch bar iron and shall be secured by at least three lever bars of one and one-half by three-eighths inch iron, working together and so arranged as to be operated on either side of the door.

(e) Sliding iron doors shall slide in channels at the top and bottom; bottom channels shall be formed by two angles two and one-half by three-eighths inch and one and one-half by one-fourth inch; top channels to be formed by two angles two by three-eighths inch and one and one-half by one-fourth inch; channels shall be securely riveted or bolted through the wall frame and where they extend beyond the wall frame shall be firmly bolted to the wall by expansion bolts. Track shall be without incline, of one-half by one-half inch iron securely riveted on the upper side of the angle iron channel. Hangers shall be of the anti-friction pattern and securely fastened to the door plate by at least four one-half inch bolts. Wheels shall be of cast iron three-fourths by four and one-half inches.

(f) Sills between iron doors shall be of one-fourth inch iron or steel with edges securely fastened to one and one-half by one and one-half by one-fourth inch angle iron or heavier, on the inner side of the wall frame. Where adjoining floors are of concrete construction, sill plates may be omitted.

(g) When tin-clad doors are used they shall be made of three thicknesses of thirteen-sixteenths inch seasoned, non-resinous wood, of good sound quality, free from sap and large or loose knots, tongued and grooved, dressed on both sides and not exceeding eight inches in width. The outside layers shall be vertical, the inside layer shall be horizontal; layers shall be securely fastened togetheer by wrought iron clinch nails driven in flush and clinched so as to leave smooth surfaces. The woodwork shall be thoroughly covered with terne plate tin of size fourteen by twenty inches, weighing not less than one hundred and thirteen pounds per box of one hundred and twelve sheets; all joints shall be locked one-half inch and nailed under seams, except on edges of door; vertical joints shall be double locked, horizontal joints single locked. Nails used to fasten tin shall be No. 13 gauge, flat head, full barbed wire, two inches long.

(h) Swinging tin-clad doors shall have three-eighths by two and one-half inch wrought iron hinges bolted to doors with four three-eighth inch bolts. Doors in excess of seven feet in height shall be provided with three hinges and have wrought iron wall eyes built in wall, or riveted to wall frame, or bolted through wall with three-fourth inch bolts. They shall have at least three level bars of one and one-half by three-eighths inch iron working together; the latch shall be placed so it can be operated from either side of the door and provided with proper keepers bolted through the door, with the spring to insure latching; catches shall be made of one-half inch wrought iron securely bolted to wall or wall frame.

(i) Sliding tin-clad doors shall have

tracks inclined three-fourths inch to the foot, made of three and one-half by three-eighths inch rolled steel, or round bars, or round pipes of equal strength, securely bolted through wall with three-fourths inch bolts. Hangers shall be made of three-eighths by three and one-half inch wrought iron attached by not less than one-inch bolts. Wheels shall be of malleable or wrought iron with not less than one and one-half inches bearing on axle. Doors over six feet wide shall have three hangers and shall be provided with necessary binders, chafing strips, bumpers and bumper shoes.

(j) Sills between tin-clad doors shall be of one-fourth inch iron or steel riveted to a three and one-half by five by three-eighths inch angle iron on each side of the wall; angle irons to be fastened together through the wall by three-fourths inch bolts spaced not to exceed eighteen inches apart; provided, that where adjoining floors are of concrete construction, sill plates may be omitted.

(k) Rolling steel doors used as dividing wall doors shall be made either of wooden slats covered with steel or bronze, or of number 20 U. S. gauge painted steel, or of number 24 U. S. gauge galvanized steel. The edges of such doors shall run in steel channels not less than one and one-half inches deep, and three-sixteenths of an inch in thickness.

(l) Such doors shall be hung on winding shafts and helical springs of sufficient strength to counterbalance the door at any position, and shall be equipped with a device to hold the doors in a closed position if the spring is destroyed. The head of the door opening shall have baffle plates of number 12 U. S. gauge steel, which shall be reinforced around the edges by one and one-half inch angles, to act as fire and smoke stops. The openings for such doors shall have steel frames and sills as herein required for steel swinging doors.

574. **Metal or Reinforced Concrete Chimneys in Fireproof Buildings—Air Space.)** (a) Internal chimneys of rolled steel or iron may be built in buildings of fireproof construction, provided that the rolled steel shall be not less than three-eighths inch in thickness, except that the upper fifty feet of such chimney may be one-quarter of an inch in thickness, riveted in every joint, or of cast iron, providing same shall not be less than three-fourths inch in thickness and jointed by bell and spigot joints or flanged bolted joints. All joints in cast iron work shall be filled and pointed with fire clay. Such metal internal chimneys shall be securely and firmly anchored to the framing of such fireproof building at each floor line and at the roof. The lower part of each such chimney shall be lined with insulating lining for a height herein required for the respective area by Section 645 of this Chapter. The insulating lining shall be one of the linings described in Section 580 of this Chapter.

(b) Reinforced concrete not less than four inches in thickness may be used on the interior of fireproof buildings, provided the requirements for reinforced concrete and for reinforced concrete stacks elsewhere required by this Chapter shall be complied with.

(c) Internal metal or re-inforced concrete stacks on fireproof buildings shall be surrounded by continuous air space from the lowest story through the roof not less than four inches across at any point, and said air space shall be surrounded by brick, hollow tile, or reinforced concrete. No structural metal in such air space shall be without such fireproof covering.

575. **Reinforced Concrete Chimneys — How Built.)** Reinforced concrete chimneys in which the temperature of the gases is intended to exceed 750 degrees Fahrenheit, shall be lined with fire brick or magnesia or asbestos insulating lining for the height and in the manner elsewhere required by this Chapter. If the insulating is stopped anywhere below the top of a reinforced concrete chimney or if the cross section of such a chimney is changed, then the reinforcing shall be increased at such points sufficiently to prevent the formation of temperature cracks.

576. **Tenement and Apartment House Boiler Chimneys.)** Chimneys for the heating apparatus of tenement and apartment houses shall not be considered as flues used for domestic purposes.

577. **Height of Chimneys Above Roof.)** (a) The height of all chimneys and flues of stoves used for domestic purposes or open fireplaces shall be not less than five feet higher than the highest point of the roof of the building of which they are a part.

(b) The height of all chimneys and flues above the highest portion of the roof of which they are a part, where such chimneys or flues are used for other than domestic purposes or for open fireplaces, shall be determined by dividing the greatest diameter in inches by four, and the quotient thereby obtained in terms of feet, with five feet added, shall be the minimum height from the tops of such chimneys and flues above the highest portion of roof of the building. In no case shall the height of any chimney or flue be less than five feet above the roof of the building of which it is a part.

(c) The sum of the horizontal distance of any wood tank, pent house or roof house, on the same building of which any chimney shall be a part, and the vertical distance of top of such wood tank, pent house, or roof house, on the same building to a horizontal plane passed through the top of the chimney shall not be less than one and one-half times the required height of the top of the chimney above the roof. The tops of chimneys within a radius of twenty-five feet of any wood tank, pent house, or roof house, on the same building of which such chimney shall be a part shall be at least as high as the top of said wood tank, pent house, or roof house. The tops of chimneys on ridge roofs shall be not less than three feet above the ridge.

578. **Insulating Cavities — Where Required.)** All flues having a greater area than four hundred square inches shall be lined on the inside with an insulating material, which lining shall start at least two feet below the smoke inlet and shall extend upwards for at least ten times the diameter of the flue, or if said flue is not circular or square in cross section for ten times the average diameter, when the flues are of brick, stone or concrete, said insulating lining shall be fire clay brick or fire clay blocks, and if such bricks or blocks are four inches or more in thickness, they may be considered as a portion of the thickness required for the surrounding walls. The walls surrounding chimneys having an area greater than four hundred square inches shall have an insulating cavity not less than three inches wide surrounding the inner four inches of fire brick or fire clay blocks, for not less than the height required above for insulating lining and said inner core shall be built independent of the surrounding brick work and shall be free to expand or contract.

579. **Metal Chimneys in Buildings of Ordinary Slow-Burning or Mill Construction.)** Interior stacks or smoke flues of metal shall not be used in buildings of ordinary or slow burning or mill construction, unless they are surrounded by self-supporting brick or re-inforced concrete walls of the thick-

ness herein required for flues of the respective area; provided, however, that if an interior smoke pipe of steel of not less than three-eighths inch in thickness riveted in every joint, or an interior smoke pipe of cast iron not less than five-eighths inch in thickness is used, then the brick work required inside of the insulating cavity of a stack may be omitted, but such metal linings shall be lined with such insulating material for the height herein elsewhere required for stacks. If a chimney or stack is not a part of the walls of such a building, it shall be designed as an isolated chimney as required by Section 583 of this Chapter.

580. **Insulating Material for Metal Chimneys and Metal Stacks.)** (a) Fire clay brick or fire clay blocks may be used for the insulating lining of metal chimneys and stacks but not of a lesser thickness than two inches. The material shall be increased in thickness or supported on structural steel ledges and the material shall be stressed not to exceed the safe limits of stress elsewhere herein fixed for the material, or metal chimneys and metal stacks may be lined with blocks of magnesia insulation or with fused asbestos board insulation, or metal stacks or chimneys may be lined with any other insulating material tested and approved by the Commissioner of Buildings.

(b) Magnesia block insulation shall contain not less than 45 per cent of magnesia and 50 per cent asbestos fibre formed into blocks not less than 1½ inches in thickness by hydraulic pressure. After said magnesia blocks have been set, they and all metal bands and ties exposed with the flue shall be plastered with cement not less than one-half inch in thickness on one and one-half inch blocks, and one-fourth inch in thickness on one and three-fourths inch and thicker blocks.

(c) Fused asbestos board shall be made of alternate flat and corrugated sheets of asbestos board, cemented together and fused under a heat of not less than 1,000 degrees Fahrenheit to a minimum thickness of 1¼ inches. After said fused asbestos boards have been set into the flues, they and all exposed metal bands or ties shall be pointed with cement.

(d) Such magnesia blocks, fused asbestos boards, pointing cement and any other insulating material approved by the Commissioner of Buildings shall resist the disintegrating, dissolving, or diminishing action of moist steam and the acid and gaseous fumes present in the flue at any degree of heat obtainable by the combustion of the fuel used.

581. **Chimneys — Interior — Framing Around.)** In case of chimneys which are enclosed, or form part of the interior of any building, no joists or girders shall rest or be supported on the walls of such chimney, and the framing around chimneys of all kinds shall be so constructed that in no case will any joists or timbers be placed nearer than two inches from the outside face of walls of flues, and in no case shall the distance from the inside of any flue to any joists or timbers be less than seven inches.

582. **Chimneys—External Location of.)** (a) Chimneys built outside of the walls of buildings shall not encroach upon any street or alley, and shall be built as follows:

(b) If at least one side of such chimney abuts entirely upon the wall of an existing building and the chimney is throughout its entire length securely and firmly anchored to the walls of such existing building, the wall of such chimney may be built of hollow tiles, in which case, however, it shall have a cast iron base, lined with fire brick, extending to a height of at least ten feet above the street or alley grade.

583. **Chimneys—Isolated—Walls Surrounding Smoke Flues.)** Isolated chimneys shall be so designed and constructed that the stress in every part thereof, due to the weight of the stack itself and from wind pressure, shall not exceed the safe limits as provided in this Chapter for the material used.

584. **Walls Forming Smoke Flues.)** The walls forming smoke flues of one hundred and forty-four square inches area or less shall be of brick, concrete, stone, or of any one of these and burnt fire-clay flue tile lining. If only one of the above materials is used it shall not be less than eight inches in thickness. Provided, however, that such flues having walls at least three inches in thickness of continuous concrete or interlocking or rabbited joint concrete sectional flues may be used without burnt fire-clay flue tile linings. If any one of the above materials is used in combination with burnt fire-clay tile flue lining it shall be not less than four inches in thickness, and the burnt fire-clay flue lining shall be not less than three-fourths inches in thickness, and built as herein described. The walls forming smoke flues of more than one hundred and forty-four square inches area and not more than three hundred square inches area shall be of brick, concrete, stone, or any one of these and burnt fire-clay flue tile lining. If any of the above materials is used alone, it shall be not less than thirteen inches in thickness. If any one is used in combination with burnt clay flue tile lining, it shall be not less than nine inches in thickness and the fire-clay flue tile lining shall be not less than three-fourths inch in thickness and built as herein required. The walls forming flues having an area greater than three hundred square inches and less than six hundred square inches shall be built of one of the materials described above not less than twelve inches in thickness, and flues having an area greater than six hundred square inches shall have walls of one of the materials described above not less than sixteen inches in thickness, and these walls may be reduced to twelve inches in thickness at a point not less than fifty feet above the top of the breeching; provided, however, that the material of which all chimneys are constructed shall be so proportioned that it will not be subjected to a greater stress than elsewhere herein fixed as the maximum safe stress for such material.

585. **Ventilating Ducts — Chutes — Walls Forming.)** Walls forming ventilating ducts and rubbish and ash chutes shall be constructed in accordance with the regulations governing the construction of smoke flues elsewhere herein contained. Walls forming ventilating ducts shall not be less than four inches thick, and when the ventilating duct is larger than two hundred and sixty square inches the walls shall be not less than eight inches thick.

586. **Smoke Pipes Passing Through Partitions—Woodwork Around.)** (a) Where smoke pipes of diameter of six inches or less pass horizontally through a wood or a plastered stud partition, they shall be surrounded by a ventilated thimble of incombustible material with a diameter at least twelve inches greater than the diameter of the pipe.

(b) Where a smoke pipe of a greater diameter than six inches passes through a wood or plastered stud partition, it shall be surrounded either by a body of brick, hollow tile, porous terra cotta or other incombustible substance, measuring at least eight inches all around such smoke pipe. Smoke pipes of less diameter than twelve inches shall be kept at least twelve inches distant from any combustible partition, ceiling or floor, and such woodwork imme-

diately over and for a distance of two feet on each side of such smoke pipe shall be covered with sheet metal or with porous terra cotta, hollow tile or plaster.

(c) Smoke pipes of greater diameter than twelve inches and less area than six square feet, shall be kept at least twenty inches away from any woodwork. Such woodwork shall be protected as above specified for smaller smoke pipes to a distance of four feet on each side of such smoke pipe; provided, that in case of low pressure boilers used for heating purposes only, the distance from a smoke pipe to any woodwork shall not be less than two feet.

(d) Whenever smoke pipes of larger area than six square feet are used, they shall be kept at least three feet distant from any woodwork, and such woodwork for a distance of at least six feet on either side of such smoke pipes shall be protected as before specified for smaller pipes.

587. **Floors—Protection of—Around Boilers, Furnaces, Etc.)** Wherever steam boilers, furnaces, ovens, coffee roasters, or other structures in which fires are maintained, except stoves for domestic purposes standing on legs and affording not less than four inches air space, are set inside of a building, the floors under the same if not already fireproof, shall be taken out and replaced by a floor of fireproof material extending not less than six feet in each direction from the boiler or such other appliances.

588. **Ceiling—Protection of—Around Boilers, Furnaces, Etc.)** The space between the tops of all steam boilers and furnaces and any wood ceiling construction shall in no case be less than three feet, unless such boiler carry not more than ten pounds pressure, in which case such space shall be not less than eighteen inches. All wood sheathing, wood laths or other combustible ceiling finish, shall be removed from above and for a space of two feet on all sides of such boilers and smoke pipes and the ceiling given at least two coats of whitewash or fire-retarding paint, and the top of such boilers and the top and sides of such smoke pipes shall be covered with at least three inches of asbestos cement or two inches of eighty-five percent magnesia and an outer covering of one-half inch asbestos cement, or such equivalent protection as may be approved by the Commissioner of Buildings; or the under side of such wood ceiling construction over the boiler or furnace and also over the smoke pipe leading from same and extending at least two feet in each direction beyond the boiler or furnace and smoke pipe shall be protected either by three coats of plastering on metallic lath or wire netting, or at least two inches of porus terra cotta or hollow tile covered on the under side with a heavy coat of plaster. If metal is used in the construction of smoke-pipes, such metal shall be of thickness not less than No. 14 U. S. gauge.

589. **Boilers—Location of—Permit for.)** In all cases, boilers shall be so placed as to give ample room between any ceiling, wall or partition to connect or operate any valves or pipes or other connections used on such steam boilers. The size, number and location of boilers to be installed in any building shall be marked on the plans and, except in buildings of Class III, approved by the Department of Smoke Inspection of Steam Boilers and Steam Plants, and by the Department of Smoke Inspection, before a permit is issued by the Department of Buildings for the erection of such building.

590. **Cupolas of Foundries.)** Cupolas of foundries shall extend at least twenty-five feet above the highest point of any roof within a radius of forty feet of such cupola.

591. **Cornices — Eaves — Gutters — Pipes from Roof.)** (a) No wood shall be used for any purpose in connection with cornices, eaves and external gutters on any building more than fifty feet in height. The entire exterior covering of cornices and eaves of buildings hereafter to be erected within the fire limits shall be of incombustible material.

(b) Wherever sheet metal cornices or eaves or external gutters are used, their entire exterior covering shall be of metal or other incombustible material approved by the Commissioner of Buildings. Bracket supports for same shall be firmly secured to the wall at least every four feet, and the walls shall be carried full height under and behind same throughout their entire length.

(c) The water from all roofs shall be carried to the sewer in metal conductor pipes. Every such conductor shall be continually maintained in good condition, and if such conductors are within the exterior walls, they shall be of screwed-joint iron or steel pipe, or of cast iron pipe with calked joints.

592. **Towers, Domes and Spires—Construction of.)** Towers, domes and spires may be built on top of the roofs of buildings, but shall not occupy more than one-quarter of the street frontage of any building. Such towers, domes, or spires, if any part thereof is built to a height of more than fifty feet and less than ninety feet, shall be of slow-burning construction, and, if of a greater height then ninety feet above the sidewalk, shall be of fireproof construction; and, in all cases where the area of such tower, dome, or spire exceeds one hundred square feet, its supports shall be carried down to the ground, and shall be, if the structure supported is more than fifty feet and less than ninety feet high, of slow-burning construction, and, if more than ninety feet high, of fireproof construction. No tower, dome, or spire shall exceed thirty-six hundred (3,600) square feet in area, and in no case shall the area exceed fifteen per cent of the total area of the building on which it is erected, nor shall the height of any tower, dome or spire exceed four hundred feet measured from the established inside grade.

592a. **Structures—Construction and Limitations of.)** All structures built within the City other than those otherwise specifically provided for herein shall be designed and constructed according to established engineering practice, and shall comply with the provisions of this section. No structure of frame or mill construction within the fire limits shall exceed 35 feet in height from the ground to the highest point thereof. No structure of mill or frame construction outside the fire limits shall exceed the height of 45 feet from the ground to the highest point thereof.

All structures over 35 feet in height within the fire limits, and all structures over 45 feet in height outside the fire limits shall be built of structural steel, concrete or masonry.

If it is desired to enclose any structure, such structure shall be enclosed with concrete or masonry walls, or incombustible material of such construction as shall be approved by the Commissioner of Buildings; provided that structures outside the fire limits not exceeding 2,800 square feet in area, or 45 feet in height, may be enclosed with combustible material.

In every structure contemplated by this section, safe and adequate means of ingress and egress shall be provided for persons employed in and about the same.

All structures whose height exceeds twice their least dimensions at their base shall be so designed as to safely resist a wind pressure of 30 pounds per square foot of surface exposed to the action of the wind.

593. **Skylights—Construction of—Glass in.)** (a) Any skylight on the roof of any building less than ninety feet in height, other than a frame building, shall have the sides, sashes and frames constructed of metal, or of wood, metal clad on all exterior surfaces. Any skylight on a building more than ninety feet in height shall be entirely of incombustible material.

(b) Every skylight shall be provided with ventilation opening of an area of at least three per cent of the base area of the skylight.

(c) The glass in all such skylights, except in buildings in Classes III and VI, not exceeding three stories in height, shall have at least six inches over same a strong wire netting with wire not lighter than number twelve gauge, galvanized after weaving, and mesh not coarser than one by one inch, unless the glass contains a wire netting within itself. Supports for screen shall not be less in size than the bars supported and of the same material.

594. **Enclosures Upon Roofs.)** It shall be permitted to erect on the roofs of all buildings more than fifty feet and less than ninety feet high, skylights, inclosures for water tanks and inclosures for elevator machinery, the construction of all of which inclosures shall be entirely of incombustible material; provided, however, that the roofs of same may be built of mill or slow-burning construction.

595. **Roof—Construction of—Pitch of.)** Buildings, other than frame buildings when permitted by this Chapter, less than fifty feet in height with roofs which have a slope of more than three inches per horizontal foot, shall have the roofs covered with incombustible material. Buildings more than fifty feet and less than ninety feet in height with roofs which have a slope greater than three inches per horizontal foot and which are of timber construction, shall have such roofs covered with an incombustible covering upon the roof boards, which shall be made either of mortar or porus terra cotta or plaster boards or other incombustible material, which shall be at least two inches thick. Where this covering is placed upon the roof boards wooden strips shall be inserted, which shall be securely fastened to the wooden structure at regular intervals between the incombustible covering and a weatherproof covering of incombustible material.

596. **Roofs—Shingle or Gravel.)** (a) The use of shingles or other forms of combustible roof covering erected or altered, otherwise than provided in Section 657, within the fire limits, is prohibited, except as hereinafter provided. In existing frame buildings not more than three stories high, the shingle roofs may be repaired with shingles or other materials.

(b) Roofs, the slope of which is not more than three inches per foot horizontal, and the covering of which is made of a composition of felt and gravel, shall be considered incombustible under the provisions of this Chapter, and may be used upon buildings of all classes. Other forms of composition roof shall be permitted if expressly approved as an incombustible roof by the Commissioner of Buildings.

597. **Window and Door Sills—Columns and Lintels Supporting Store Fronts—Incombustible.)** (a) For buildings other than frame buildings window and door sills shall be made of incombustible material. Oak timber used for door sills and not less than eight inches thick by the full width of the wall in which such sills occur, shall, for the purpose of this Chapter, be counted incombustible.

(b) In buildings other than frame and excepting buildings of Classes III and VI, lintels shall be of incombustible material; provided that in one-story store front buildings columns and lintels may be of combustible material.

598. **Buildings—Height of.)** (a) The limits of heights of buildings hereinbefore given for non-fireproof buildings shall be from the average established sidewalk level to the highest point of roof thereof.

(b) The height of a fireproof building shall be measured from the average inside grade line of the street frontage of the building to the top of the highest point of the external bearing walls.

(HEIGHT OF BUILDINGS: *See ordinance following the Building Ordinance, which ordinance was passed Dec. 19, 1910, pending the action of Com. on Buildings, and to remain in effect until February 25, 1911, unless sooner revised.*)

(d) Roof houses for elevators, or tanks, or skylights, or stairs, or scuttles may be built above the height of the main roof.

599. **Basement and Cellar Defined.)** A basement shall be defined as a story the floor of which is more than two feet below the average finished street grade or whose ceiling is less than nine feet above said grade at the front of the building; but this definition of a basement shall not apply to buildings of Classes VI and VIII.

600. **Sub-basements and Cellars—Construction of.)** (a) No building shall have more than one basement or cellar of ordinary or slow-burning, or mill construction; all additional basements or cellars shall be of fireproof construction as described in this Chapter, the elevator enclosures shall be of brick from the lowest basement floor level to the first story floor, and the stairways shall be inclosed in fireproof partitions from the lowest basement floor level to the first story floor level with automatic closing standard iron doors, opening outwards.

(b) In cases where a pipe, conduit, dumb-waiter, cable, wire, conveyor or belt, or any combination thereof, passes through a floor from one basement to another, the opening in the floor shall be inclosed as specified in this Chapter.

(c) The number and width of stairs from the lowest basement floor to the first story shall be the same as required for the four highest stories of a building of the same area.

601. **Canopy—Plans Must Be Approved by Commissioner of Buildings Before Permit Issued by Department of Public Works.)** It shall be unlawful for any person, firm or corporation to erect or construct any canopy under any general or special ordinance which shall or may hereafter be adopted by the City Council of Chicago without first submitting the plans of such canopy to the Commissioner of Buildings for his approval. No permit shall be issued by the Department of Public Works for a canopy unless the plans of said canopy shall bear the approval of the Commissioner of Buildings.

602. **Courts and Light Shafts in Buildings.)** (a) Every court or light shaft of every building shall be open and unobstructed from the bottom of such court to the sky, with the exception that fire escapes may be built therein, and such courts shall have walls constructed in the same manner as is required for the exterior walls of such buildings; provided, that no walls inclosing such courts are required on street or alley lot lines.

(b) All windows, doors or other openings in court walls, except as otherwise provided in this Chapter, shall have metal frames, metal sashes and metal doors, with the glazed portions thereof of wired glass.

603. **Bay Windows—Light Courts—Shafts—Construction of.)** (a) The walls of every bay window and every court in every ma-

sonry constructed building, except buildings of Class III, shall be built of brick or other fireproof construction throughout as required for exterior walls.

(b) The walls of every vent shaft of every masonry constructed building, except buildings of Class III, shall be built of masonry or a fireproof material not less than four inches in thickness supported by steel or iron.

(c) Every court, light shaft, or vent shaft in every building shall be open and unobstructed from the bottom of such court to the sky with the exception that fire escapes may be built in courts or light shafts, subject to all the provisions of this Chapter.

(d) All windows, doors, or other openings in court walls, except as otherwise provided in this Chapter, shall have metal frames, metal sashes and metal doors with the glazed portion thereof of wired glass.

604. **Windows, Cleaning of—Safety Devices.)** The owner or agent of every building in the city shall equip each and every window in any such building above the first story thereof with a suitable device or devices which will permit the cleaning of the exterior of each and every window in such building above the first story without danger to the person cleaning such windows, and such devices shall be of such pattern and construction as will reasonably and safely answer the purposes for which they are intended; provided, however, that if windows are of such construction that they may be easily cleaned from the inside they need not be equipped with such devices.

605. **Scaffolds—Protection During Building Operations—Temporary Floors.)** (a) All scaffolds erected in this city for use in the erection, repair, alteration, or removal of buildings, shall be well and safely supported, and of sufficient width, and properly secured, so as to insure the safety of persons working thereon or passing under or by the same; and to prevent the falling thereof, or of any material that may be used, placed or deposited thereon.

(b) It shall be the duty of every owner, person or corporation who shall have the supervision or control of the construction of or remodeling of any building having more than three framed floors, whether some or all of such floors are above the established street grade, to provide and lay upon the upper side of the joists or girders, or both, of the first floor below the riveters and structural steel setters, a plank floor, which shall be laid to form a good and substantial temporary floor for the protection of the employes and all persons engaged above or below or on such temporary floor in such building.

(c) Provided, however, that where the permanent floor is in place on the floor herein required to be planked, a temporary protective floor shall not be required.

(d) A good and substantial temporary floor shall be laid on the joists or girders of the next lower floor where the temporary or permanent floor of the second story or the floor or floors above the second story or roof is being placed previous to the placing of the permanent floor or floors immediately below the floor which is being arched or planked. The lowest framed floor in a building shall be considered the first floor.

(e) In buildings more than three stories high where persons are working on a scaffold or scaffolds on the outside of such building such persons shall be protected by well secured planking, set over the heads of such persons for the full width of the scaffolding on which they are working if another story or other stories are being raised above such persons during the time they are working on such outside scaffold or scaffolding.

(f) It shall be the duty of all owners, contractors, builders or persons having the control or supervision of all buildings in course of erection which shall be more than thirty feet high, to see that all stairways, elevator openings, flues and all other openings in the floors shall be covered or properly protected, and it shall be their further duty to comply with an act of the State Legislature providing for the protection and safety of persons in or about the construction, repairing. alteration or removal of buildings, bridges, viaducts and other structures, approved June 3, 1907, and in force July 1, 1907.

(g) Any person, firm or corporation violating any of the provisions of this section shall be fined not less than one hundred dollars nor more than two hundred dollars for each offense, and any permit granted for the construction of such building may be revoked in the discretion of the Commissioner of Buildings where such violation occurs.

607. **Sidewalk and Street—Occupation of —Limitations.)** (a) The extent of occupation of sidewalk and street to be covered by the terms of a permit for street obstruction or building, shall be as follows:

(b) Such permit shall not authorize the occupation of any sidewalk or street or part thereof other than that immediately in front of the lot or lots upon which any building is in process of erection and in relation to which such permit is issued.

(c) During the progress of building operations, a sidewalk not less than six feet in width shall be at all times kept open and unobstructed for the purpose of passage in front of such lot or lots. Such sidewalk shall, if there are excavations on either side of the same, be protected by substantial railings which shall be built and maintained thereon so long as excavations continue to exist. It is not intended hereby to prohibit the maintenance of a driveway for the delivery of material across such sidewalk from the curb line to the building site.

608. **Sidewalks—Delivery of Material—Elevated Sidewalks.)** It shall be permitted for the purposes of delivering material to the basements of buildings in process of erection to erect elevated temporary sidewalks to a height of not exceeding four feet above the curb level of the street, and in case a sidewalk is so elevated it shall be provided with good, substantial steps or easy inclines on both ends of the same and shall have railings on both sides thereof.

609. **Temporary Roof Over Sidewalk—Time Maintained.)** When buildings are erected of a height greater than four stories and such buildings are near the street line, there shall be built over the adjoining sidewalk a roof having a framework composed of supports and stringers of three by twelve timbers not more than four feet from center to center, covered by two layers of two-inch plank. When additonal stories are added to an existing building and such building is located near the street line, there shall be built over the sidewalk, at the point where the new stories commence, a scaffold not less than six feet wide, which shall form a covering over the sidewalk composed of a framework of stringers and supports, covered by two layers of two-inch planks. Such framework and covering shall be of such construction and design as shall be satisfactory to the Commissioner of Buildings. Such roof shall be maintained as long as material is being used or handled on such street front above the level of the sidewalk. Temporary sidewalks, their railings, approaches and roofs over same, shall be made with regard to ease of approach, strength, and safety, to the satisfaction of the Commissioner of Buildings.

610. **Storage of Building Materials—Limitations.)** The occupation of the street

for the storage of building material for any one building or for temporary sidewalks, shall never exceed one-third of the width of the roadway of the same, and in no event shall any material be stored or placed within four feet of any steam or street railway track, and in all cases where such obstruction of the street is made there shall be a clear space of not less than one foot between such obstruction and the curb line. Provided, that the Commissioner of Buildings and the Commissioner of Public Works, or either of them, may limit, or entirely restrict, the storage of material on any street or alley where a tunnel, conduit, or any underground passageway or subway is located.

611. **Sidewalks and Street — Excavated Material and Rubbish On—How Cared for.)** Earth, other than sand to be used in the construction of the building, taken from excavations, and rubbish taken from buildings shall not be stored either upon the sidewalks or roadways of streets, and shall be removed therefrom from day to day as rapidly as produced. When dry rubbish is being handled, it shall be kept wetted down so as to prevent its being blown about by the wind.

612. **Use of Derricks.)** For all buildings more than four stories in height the use of derricks set upon the sidewalk or street is prohibited. In no case shall the guy lines be less than fifteen feet above the roadbed.

613. **Frontage Adjacent—How Occupied for Building Purposes.)** If the written consent of and a waiver of claims for damages against the city by the owners of properties adjoining the site of any proposed building is first obtained and filed with the Commissioner of Public Works, the permission to occupy the roadway and the sidewalk may be extended beyond the limits of such building in front of the property for which the consent of the owner or lessee thereof has been secured upon the same terms and conditions as those herein fixed for the occupation of sidewalk and street in front of the building site.

614. **Street—Use of for Building Purposes—When Terminated—Red Lights.)** (a) The permission to occupy streets and sidewalks for the purposes of building is intended only for use in connection with the actual erection, repair, alteration or removal of buildings, and shall terminate with the completion of such operation. It shall be unlawful to occupy any sidewalk or street after the completion of the operation for which a permit has been issued by the Department of Buildings. It shall also be unlawful to occupy a sidewalk or street, under authority of such permit, for the storage of articles not intended for immediate use in connection with the operations for which such permit has been issued.

(b) Red lanterns shall be displayed and maintained during the whole of every night at each end of every pile of material in any street or alley and at each end of every excavation.

615. **Street Obstructions—Permits—Bonds —Fees.)** (a) Permits for the obstruction of streets shall be issued by the Commissioner of Public Works and shall be paid in proportion to the street frontage occupied at the rate of two dollars per month for every twenty-five (25) feet, or fractional part thereof, of frontage so occupied, and before any permit shall be granted to any person, firm or corporation for the obstruction of any street or streets or sidewalk, an estimate of the cost of restoring said street and sidewalk to a condition equally as good as before it shall have been obstructed, with a fair additional margin for contingent damages, shall be made by the Commissioner of Public Works, which in no case shall be less than one dollar per foot, or fractional part thereof, frontage of the portion of the street to be obstructed, and a deposit shall be required of the person, firm or corporation desiring to obstruct said street or sidewalk. Such deposit, less the charge of two dollars per month for each twenty-five feet of frontage used, shall be returned upon the restoration of the said street and sidewalk to a condition equally as good as before it was obstructed. When the Commissioner of Public Works shall receive satisfactory proof that said street and sidewalk have been restored to a condition equally as good as before it was obstructed, he shall issue a certificate to the Comptroller, certifying to said fact, and the comptroller shall thereupon forthwith issue a warrant on the City Treasurer for the amount of money thus deposited less the deduction herein provided for. But if the person, firm or corporation thus obstructing said street or sidewalk shall fail to restore the same to a condition equally as good as before it was obstructed within three (3) days from and after the completion of the building or structure for which said deposit was required, then the city shall have the right to use such portion of said deposit as may be necessary to remove the obstructions and to restore the said street and sidewalk to a condition equally as good as it was before it was obstructed, and the amount thus expended shall be deducted from the amount of said deposit; provided, however, that nothing herein contained shall preclude the city from maintaining an action against the person, firm or corporation to recover for damage done to any street or sidewalk. No permit shall be issued until the applicant therefor shall have executed and filed with the Commissioner of Public Works a bond, with sureties to be approved by said Commissioner, and in an amount to be designated by him, in no case to be less than ten thousand dollars, conditioned to indemnify, save and keep harmless the city from any and all loss, cost, expense or liability of any kind whatsoever which it, the city, may suffer or be put to, or which may be recovered from it from or by reason of the issuance of such permit, or by reason of any act or thing done or neglected to be done under or by virtue of the authority given in such permit and the requirements of the city ordinances.

(b) Any permit issued pursuant to the terms of this ordinance may be revoked by the Commissioner of Public Works at any time.

616. **Stables and Barns—Regulations.)** (a) It shall be unlawful for any person, firm or corporation to convert any building for the use of or to construct any stable or barn for the housing or keeping of horses or other animals on any lot abutting on a street or alley in which a public sewer is constructed without providing said stable or barn with an impervious floor properly drained to such sewer.

(b) It shall be unlawful for any person, firm or corporation to construct or locate any boarding, sales, or private stable or barn on the front two-thirds of any lot on any street where one-half of the buildings on both sides of the street between the next nearest intersecting streets are used exclusively for residence purposes.

617. **Tannery Not to Be Placed Within 600 Feet of Any Church, Public or Private School.)** It shall be unlawful for any person, firm or corporation to build, construct, locate or maintain any building used, or to be used, for a tannery within six hundred feet measured from the nearest point of the tannery to the nearest point of any building used for a church or for a public or private school.

617½. **Gas Reservoir Not to Be Placed Within 500 Feet of any Public School.)** It shall be unlawful for any person, firm or corporation to build, construct, locate or maintain any tank used or to be used for a gas reservoir within 500 feet of any public school. Said distance to be measured from the nearest point of the building or structure used for a gas reservoir to the nearest point of any building used for a public school.

618. **Architect—Must Certify That Plans Comply With Building Ordinances.)** It shall be unlawful for any architect or other person permitted under the state law to prepare plans to prepare and submit to the Commissioner of Buildings for his approval any final plans for any building or structure which do not comply with structural requirements of this Chapter. It shall be the duty of the Commissioner of Buildings to require that all final plans submitted to him for approval of any building or structure shall be accompanied by a certificate of such architect or such other person preparing plans that the plans and specifications submitted comply with the structural requirements of this Chapter.

ARTICLE XIII.

Fireproof Construction.

619. **Fireproof Construction — Definition of.)** The term "fireproof construction" shall apply to all buildings in which all parts that carry weights or resist strains, and also all exterior walls and all interior walls and all interior partitions and all stairways and all elevator incosures, are made entirely of incombustible material, and in which all metallic structural members are protected against the effects of fire by coverings of a material which shall be entirely incombustible, and a slow heat conductor, and hereinafter termed "fireproof material." Reinforced concrete as defined in this ordinance shall be considered fireproof construction.

620. **Fireproof Material—Definition of.)** The materials which shall be considered as filling the conditions of fireproof covering are: First, burnt brick; second, tiles of burnt clay; third, approved cement concrete; fourth, terra cotta.

621. **Fireproof Construction—Tests For.)** (a) In cases in which it is claimed that any equally good or more desirable mode or manner of construction, or material, or device for fireproofing, other than specified in this Chapter, can be used in the erection or alteration of buildings, the Commissioner of Buildings, upon written application to him for a permit to use the same, shall have power to appoint a Board of Examiners, consisting of not less than three nor more than five members, each of whom shall have at least ten years' experience as an architect, engineer or builder, who shall take the usual oath of office. Said oath of office shall be administered by the Commissioner of Buildings. The said examiners shall adopt rules and specifications for examining and testing such mode or manner of construction or material, or device for fireproofing, and furnish a copy of the same to the applicant. And such specifications shall provide that the material to be tested shall withstand successfully a fire of two hours' duration, rising to 1,700 degrees temperature, Fahrenheit, in the first thirty minutes and remaining at that temperature for the following ninety minutes. At the end of the two hours the material shall be quenched with at least a 1⅛-inch stream of water for five minutes, at a nozzle pressure of fifty pounds per square inch. The said examiners shall notify such applicant to submit the proposed material for such examination and test; and such tests shall be made in the presence of the said examiners, or a majority thereof, according to such rules and specifications. All expenses of such examiners and such examinations and tests, shall be paid by the applicant, and said examiners may require security therefor.

(b) The said examiners shall within 30 days after such examination and tests, certify the results of such test, and their decision on the said application to the Commissioner of Buildings, who shall in the event of the examination and tests being satisfactory, authorize the use of such material or construction as fireproof material.

(c) A complete record of the proceedings and all acts and decisions of the said Board of Examiners shall be kept by the Commissioner of Buildings in his office.

(d) The Commissioner of Buildings shall have the power to pass upon any question relative to the mode or manner of construction or materials to be used for fireproofing in the erection or alteration of any building or structure to make the same conform to the true intent and meaning of the several provisions of this Chapter.

622. **Incombustible Material.)** The following materials shall be considered as incombustible material: A metal or fire-resisting glass of not less than one-quarter of an inch in thickness, metal, plastering, plaster blocks, stone, granite, marble, approved cinder concrete, or one of the fireproof materials described in this chapter.

623. **Walls—Enclosing in Buildings of Steel Skeleton Construction.)** If buildings are made of fireproof construction, and have skeleton construction so designed that their enclosing walls do not carry the weight of floors or roof, then their walls shall not be less than twelve inches in thickness; provided, such walls shall be thoroughly anchored to the iron skeleton, and whenever the weight of such walls rests upon beams or columns, such beams or columns shall be made strong enough in each story to carry the weight of wall resting upon them without reliance upon the walls below them. All walls shall be of fireproof or incombustible material.

624. **Columns—Exterior.)** (a) All iron or steel used as vertical supporting member of the external construction of any building exceeding fifty feet in height shall be protected against the effects of external change of temperature, and of fire by a covering of fireproof material consisting of at least four inches of brick, hollow terra cotta, concrete, burnt clay tiles, or of a combination of any two of these materials, provided that their combined thickness is not less than four inches. The distance of the extreme projection of the metal, where such metal projects beyond the face of the column, shall be not less than two inches from the face of the fireproofing; provided, that the inner side of exterior columns shall be fireproofed as hereafter required for interior columns.

(b) Where stone or other incombustible material not of the type defined in this ordinance as fireproof material is used for the exterior facing of a building, the distance between the back of the facing and extreme projection of the metal of the column proper shall be at least two inches, and the intervening space shall be filled with one of the fireproof materials.

(c) In all cases, the brick, burnt clay, tile or terra cotta, if used as a fireproof covering, shall be bedded in cement mortar close up to the iron or steel members, and all joints shall be made full and solid.

625. **Columns—Interior.)** (a) Covering of interior columns shall consist of one or more of the fireproof materials herein described.

(b) If such covering is of brick it shall

be not less than four inches thick; if of concrete, not less than three inches thick; if of burnt clay tile, such covering shall be in two consecutive layers, each not less than two inches thick, each having one air space of not less than one-half inch, and in no such burnt clay tile shall the burnt clay be less than five-eighths of an inch thick; or if of porous clay solid tiles, it shall consist of at least two consecutive layers, each not less than two inches thick; or if constituted of a combination of any two of these materials, one-half of the total thickness required for each of the materials shall be applied, provided that if concrete is used for such layer it shall not be less than two inches thick.

(c) In the case of columns having an "H" shaped cross section or of columns having any other cross section with channels or chases open from base plates to cap plates on one or more sides of the columns, then the thickness of the fireproof covering may be reduced to two and one-half inches, measuring in the direction in which the flange or flanges project, and provided that the thin edge in the projecting flange or arms of the cross sections does not exceed three-quarters of an inch in thickness. The thickness of the fireproof covering on all surfaces measuring more than three-quarters of an inch wide and measuring in a direction perpendicular to such surfaces shall be not less than that specified for interior columns in the beginning of this section, and all spaces, including channels or chases between the fireproof covering and the metal of the columns, shall be filled solid with fireproof material. Lattice or other open columns shall be completely filled with approved cement concrete.

626. **Columns—Wiring Clay Tile On.)** (a) Burnt clay tile column covering shall be secured by winding wire around the columns after the tile has all been set around such columns. The wire shall be securely wound around tile in such manner that every tile is crossed at least once by a wire. If iron or steel wire is used it shall be galvanized and no wire used shall be less than number twelve gauge.

(b) In places where there is trucking or wheeling, or handling of packages of any kind, the lower five feet of every column with hollow tile shall be incased in a protective covering of No. 16 U. S. gauge steel embedded in concrete.

627. **Concrete—Approved Cement—When Fireproof.)** (a) All approved cement concrete shall consist of a standard Portland cement, torpedo sand, and crushed stone or gravel, or crushed blast furnace slag, or crushed burnt clay, the volumetric quantity of any one of these materials in addition to the torpedo sand shall not exceed eight times the volume of the Portland cement. All of the ingredients of cement concrete shall be thoroughly worked and wet so as to cover each piece of stone or gravel or slag or burnt clay with moistened cement; and the cement and sand shall fill the voids between the coarse material of the cement concrete.

(b) Cement concrete to be considered a fireproof material shall be cast and worked in an unset condition against the metal. In all cases where cinder concrete is used, the metal shall be protected as required by Section 568 of this chapter.

628. **Concrete Ingredients.)** (a) The separate ingredients of concrete shall be measured for each batch, and shall be thoroughly mixed and must be uniform in color, appearance and consistency before placing. The concrete shall be worked continuously with suitable tools, as it is put in place, filling the forms completely.

(b) The sand to be used for concrete shall be clean coarse sand, free from loam or dirt. If crushed stone grit is used it shall be clean, gritty, and free from dust.

(c) The stone to be used in concrete shall be clean crushed hard stone, or clean crushed blast furnace slag, or gravel, and of a size to pass through a 1½-inch square mesh. If limestone or slag is used, it shall be screened to remove all dust; if gravel is used, it shall be thoroughly washed. Stone shall be drenched immediately before using.

(d) In all cases, the brick or hollow tile, solid or terra cotta shall be bedded in cement mortar close up to the iron or steel member and all joints shall be made full and solid.

629. **Pipes Enclosed by Covering.)** (a) Pipes shall not be enclosed in the fireproofing of columns or in the fireproofing of other structural members of any fireproof building; provided, however, gas or electric light conduits not exceeding one inch diameter may be inserted in the outer three-fourths inch of the fireproofing of such structural member, where such fireproofing is entirely composed of concrete.

(b) Pipes or conduits may rest upon the tops of the steel floor beams or girders, provided they are imbedded in cinder concrete to which slaked lime equal to five per cent of the volume of concrete has been added before mixing or their being imbedded in stone concrete.

630. **Shafts—Doors—Frames—Enclosure.)** (a) In cases where a pipe, conduit, dumb waiter, cable wire, conveyor, belt, or any combination thereof, passes from one story to another story through an open hatch or floor opening, a shaft or enclosure of fireproof material shall be built from floor to floor around such hatch or floor opening in each story above and below such hatch or floor opening in the same manner as described for fireproof partitions in this chapter, and no wood shall be used in the construction, support or fittings of such shaft. The area of space thus enclosed shall not exceed the area of the floor opening by more than one hundred per centum.

(b) All burnt clay or terra cotta partitions or walls around such shafts shall be plastered on the outside and plastered or pointed on the inside.

(c) All doors, frames, sashes, casings and windows in partitions or walls around such floor openings, shall be built of incombustible material. The supports of such doors, frames, sashes, casings and windows shall also be of incombustible material. In the case of doors, such supports shall be of rolled structural metal extending from floor to ceiling and secured to both. Where there are brick walls of twelve inches or more in thickness, the supports need not extend to ceiling as above specified. All glass used in connection with such partitions or walls shall be wired glass.

(d) Such fireproof enclosures may be omitted if all of the space in each floor opening not occupied by pipes, conduits, cables, wires, or any combination thereof, are filled in solid fireproof material not less than eight inches thick.

631. **Spandrel Beams, Girders, Lintel.)** The metal of the exterior side of the spandrel beams or spandrel girders of exterior walls, or lintels of exterior walls, which support a part of exterior walls, shall be covered in the same manner, and with the same material as specified for the exterior columns in this chapter; provided, however, that shelf angles connected to girders by brackets or projections of girder flanges not figured as part of the flange section, may come within two inches of the face of the brick or other covering of such spandrel beams, girders or lintels. The covering thickness shall be measured from the extreme projection of the metal in every case.

632. **Beams, Girders and Trusses—Cover-**

ings of.) (a) The metal beams, girders and trusses of the interior structural parts of a building shall be covered by one of the fireproof materials hereinbefore specified so applied as to be supported entirely by the beam or girder protected, and shall be held in place by the support of the flanges of such beams or girders and by the cement mortar used in setting.

(b) If the covering is of brick, it shall be not less than four inches thick; if of hollow tiles or if of solid porous tiles, or if of terra cotta, such tiles shall be not less than two inches thick, applied to the metal in a bed of cement mortar; hollow tiles shall be constructed in such a manner that there shall be one air space of at least three-fourths of an inch by the width of the metal surface to be covered within such clay coverings; the minimum thickness of concrete on the bottom and sides of metal shall be two inches.

(c) The top of all beams, girders, and trusses, shall be protected with not less than two inches of concrete or one inch of burnt clay bedded solid on the metal in cement mortar.

(d) In all cases of beams, girders or trusses, in roofs or floors, the protection of the bottom flanges of the beams and girders and so much of the web of the same as is not covered by the arches shall be made as hereinbefore specified for the covering of beams and girders. In every case the thickness of the covering shall be measured from the extreme projection of the metal, and the entire space or spaces between the covering and the metal shall be filled solid with one of the fireproof materials, excepting the air spaces in hollow tile.

(e) Provided, however, that all girders or trusses when supporting loads from more than one story shall be fireproofed with two thicknesses of fireproof material or a combination of two fireproof materials as required for exterior columns in Section 625 of this chapter, and each covering of fireproof material shall be bedded solid in cement mortar.

633. **Fireproofing of Exterior Sides of Mullions.)** In buildings required by this chapter to be of fireproof construction on exposures where metal frames, doors, sash and wired glass are not required, all vertical door or window mullions over eight inches wide shall be faced with incombustible material, and horizontal transom bars over six inches wide shall be faced with a fireproof or with an incombustible material.

634. **Fireproof Covering, Independent.)** The fireproof covering of brick, concrete, burnt clay tiles, hollow terra cotta or of a combination of any two of these materials shall be applied to all of the structural members of the exterior of a fireproof building previous to and independent of the application of the architectural facing of such fireproof building with an incombustible or fireproof material.

635. **Walls, Support and Fireproofing of.)** Where skeleton construction is used for the whole or part of a building the enveloping material and the walls shall be independently supported on the skeleton frame for each individual story.

636. **Iron or Steel Plates for Support of Wall.)** Where iron or steel plates or angles are used in each story for the support of the facings of the walls of such story, such plates or angles shall be of sufficient strength to carry the weight within the limits of fibre stress for iron and steel elsewhere specified in this chapter of the enveloping material for such story, and such plates or angles may extend to within two inches of the exterior of such covering.

637. **Cut-out Boxes, Chases, Etc.—Fireproof Covering.)** No electric service cut-out box, switch box, cabinet, chase or any other recess, shall encroach on the minimum thickness required for any fireproof covering on structural metal, except as provided in this chapter. If the depth of any cut-out box, switch box, cabinet, or chase, or if any other recess is to be concealed, or partially concealed, then the thickness of the fireproof covering shall be increased correspondingly.

638. **Segmental and Flat Arches.)** (a) Segmental arches shall have a rise of at least one inch for each foot of span of arch.

(b) The least thickness of a hollow tile or porous terra cotta segmental arch shall be one-half of an inch per foot of span, but no such hollow tile or terra cotta arch shall be of a thickness less than five inches.

(c) Both flat and segmental arches shall be so constructed that the joints of the same radiate from a common center and there shall be a cross rib for every four inches, or fractional part thereof, in height in each tile block. The skewback of the arches shall be carefully fitted to the beams supporting them, and, in addition to the cross ribs, there shall be additonal diagonal re-enforcing ribs in the skewback. Such arches, whether flat or curved, shall have their beds well filled with cement mortar, and the centers shall not be struck until the mortar has set.

(d) Burnt clay skewbacks shall be molded in such a manner as to support the burnt clay covering on the under sides of beams or girders.

639. **Fireproof Floor and Roof Construction.)** Brick, hollow tile, porous terra cotta, or approved cement concrete, or approved cinder concrete, shall be used for the construction of floor and roofs of fireproof buildings. Flat arch hollow tile, or flat arch porous clay tile floor arches shall have a height of at least one and one-half inches for each foot of span.

640. **Wood Flooring and Nailing Strips.)** (a) Wood flooring and wooden nailing strips for such flooring may be used in fireproof buildings.

(b) Where such flooring is used in a fireproof building, the space immediately under the flooring, and between the nailing strips and under such nailing strips, shall be filled with a cement or a cinder concrete tamped into place in an unset state, or with such other incombustible material as shall be approved by the Commissioner of Buildings.

641. **Partitions in Fireproof Buildings.)** (a) Where stairs, shafts and elevators are enclosed they shall be enclosed in fireproof partitions, as described in Section 642 of this chapter; all other partitions, shall be incombustible partitions. Where blocks are used for building partitions or as enclosing walls, the joints shall be well filled with mortar.

(b) The partitions shall be wedged tight between floor and ceilings with incombustible wedges.

642. **Partitions — Fireproof — Incombustible.)** (a) Only fireproof material shall be used for fireproof partitions; if of brick, they shall be not less than four inches thick, and if of partition blocks, not less than three inches thick. If fireproof partitions are of reinforced concrete they shall be not less than three inches thick.

(b) All fireproof partitions required by this ordinance shall be supported directly on the steel construction, or on the fireproof floor arches, or on concrete, or on brick.

(c) Only fireproof or incombustible material shall be used in the construction of partitions not required to be fireproof, excepting that frames, casings, doors, sash and the rough carpenter work required for the proper fastenings of such frames, casings,

loors or sash, may be of wood, and that ordinary glass may be used in doors and partition windows.

(d) All corridor partitions of incombustible or fireproof material in fireproof buildings, shall be supported directly on the steel construction, on the fireproof floor arches, on concrete or on brick.

643. **Stairs—Landings.)** (a) Stairs in fireproof buildings shall be built of approved cement concrete, reinforced concrete, stone or metal, or a combination of one or more of such materials.

(b) The handrails of such stairways may be of wood.

(c) If stairs are constructed of solid stone or plain concrete, having the tread and riser in one piece, then there shall be not less than sixty square inches of stone or concrete in the cross section of such combined tread and riser.

(d) If stone treads have less than sixty inches of cross section and platforms less than seven inches in thickness are used, they shall have a metal sub-tread and sub-platform three thirty-seconds of an inch thick.

(e) If platforms have a floor arch subconstruction as described in Sections 638 and 639 of this chapter, then the metal sub-platform may be omitted.

644. **Roofs—Rise of Roof Above Limit of Height.)** In the case of buildings which are fireproof in their construction, the roof may rise above the limit of height of wall fixed by this chapter for such buildings at a slope not to exceed thirty degrees with the horizon, and to a height not exceeding twenty feet above such limitation of the height of the wall. The space enclosed by such roof above the limitation of the height of such wall may be used as an inclosure for pipes, ventilating or elevator machinery or for ventilating ducts, but it shall not be lawful to use such space for purposes of storage, business or residence.

645. **Sheet Metal Work—Support Of.)** Wood shall not be used as the support of any sheet metal work or of any gutter or cornice of a building more than ninety feet in height.

ARTICLE XIV.

Slow Burning Construction.

646. **Slow-Burning Construction Defined.)** The term "Slow-Burning Construction" shall apply to all buildings in which the structural members, other than walls elsewhere required to be of masonry, which carry the loads and strains which come upon the floor and roofs thereof are made wholly or in part of combustible material, but throughout which the structural metallic members, if used, shall be protected against injury from fire by coverings of fireproof material. The lower five feet of metal columns shall be protected as required in Section 634 of this chapter. Underside of joists shall be protected by a covering of three coats of plaster laid on metal lath; and a layer of mortar or other incombustible material at least one and one-half inches thick shall be applied on all floors and roof surfaces above the joists of the same.

647. **Posts, Girders and Partitions.)** Wood posts, if used, shall be of not less than one hundred square inches sectional area. Wood girders, if used, shall be of not less than seventy-two square inches sectional area. All partitions in buildings of this type shall be made entirely of incombustible material. Wood furring and wood lath shall not be permitted in buildings of this type.

648. **Stairs, Construction of.)** Where buildings are required to be of "slow burning" construction, all stairs in such building shall be of incombustible material, except as hereinafter provided. Said stairs may be of ordinary construction, if said building is equipped with an automatic sprinkler system, and stairs are enclosed in a fireproof wall.

ARTICLE XV.

Mill Construction.

649. **Definition—Mill Construction Requirements.)** The term "Mill Construction" shall apply to all buildings in which wooden posts, if used, have a sectional area of not less than one hundred square inches, and wooden girders and joists a sectional area of not less than seventy-two square inches, and roofs, if of wood, a thickness of not less than two and five-eighths inches in a single layer, and floors, if of wood, a thickness of not less than three and one-half inches in not more than two layers, the lower one of which shall be not less than two and five-eights inches in thickness, and in which all structural metallic members, if used, are fireproofed as required for fireproof construction, and in which all floors and roofs not constructed as above are of fireproof construction as elsewhere required for fireproof construction in this ordinance.

650. **Fireproofing.)** (a) Partitions in buildings of mill construction shall be made entirely of incombustible material. If iron columns, girders, or beams are used in buildings of this type they shall be protected as specified in this chapter; but the wooden posts, girders and joists need not be protected by fireproof covering. Wood furring and wood lath shall not be permitted in buildings of this type.

(b) If reinforced cinder concrete construction is used in the structural parts of a building which is required to be of slow-burning or mill construction by this chapter, then all partitions shall be of incombustible material and all parts other than structural parts and partitions of the building shall be as required for slow-burning or mill construction buildings by this chapter.

651. **Stair Construction Where Automatic Sprinkler System is Installed.)** In buildings required to be of "mill construction," all stairs in such buildings shall be of "incombustible" material, except as hereinafter provided. Said stairs may be of wood construction if said building is equipped with an automatic sprinkler system and stairs are enclosed in a fireproof wall.

ARTICLE XVI.

Ordinary Construction.

652. **Ordinary Construction Defined.)** The term "ordinary construction" as used in this chapter, means the ordinary system of construction in which timber and iron structural parts are not protected with fire-resisting coverings and in which the walls are of masonry built as required by this chapter.

ARTICLE XVII.

Frame Buildings.

653. **Repairing of Frame Buildings Within Fire Limits.)** Frame buildings within the fire limits which have been damaged by fire, decay or otherwise, to an extent not greater than fifty per cent of their value may be repaired, provided there is no increase in size of such buildings over their original dimensions, and, provided that incombustible roof covering required by Section 596 is used. And, provided, further, that where any frame building is raised for the purpose of erecting a basement story under the same, the walls enclosing such basement shall be of masonry.

654. **Frame Buildings Prohibited—Exceptions.)** (a) Hereafter no frame building

shall be erected, nor any frame addition made to any existing frame building, within the fire limits of the city, except where express provision is made in this chapter therefor.

(b) Outside the fire limits it shall be lawful to erect frame buildings not exceeding forty feet in height from the sidewalk to the highest point of roof. If such frame buildings have a basement story of masonry, their height above the sidewalk may be made not to exceed forty-five feet. Provided, however, that in no case shall any portion of any frame building above the second floor be used as a separate living apartment.

655. **Frame Buildings Within the Fire Limits Changed Into Flat Buildings—Fire Walls.)** Whenever any frame building within the fire limits shall be remodeled, altered or changed for the purpose of using the same for flats or apartments, or whenever such frame building shall be occupied for flat or apartment purposes, each suite of apartments in such building shall be separated from every other suite of apartments in such building by a wall of incombustible material, of such dimensions and thickness as required by this chapter.

656. **Frame Buildings—Raising—Requirements—Changing Gable or Hip Roofs to Flat Roofs.)** Permission may be granted by the Commissioner of Buildings for the raising of existing frame buildings, whether within or without the fire limits, to the limits of height hereinbefore fixed for new frame buildings, and no more, and inside the fire limits for the purpose of putting a masonry basement thereunder. The Commissioner of Buildings is also authorized to issue permits for changing gable or hip roofs of existing frame buildings to flat roofs, and for the raising of walls incident to such change. But if such hip or gable roof is changed to a flat roof and the walls raised in connection with such change, the total cubic contents included by the walls so raised and the roofs so altered shall not exceed the cubic contents originally included in such gable or hip roof, and in no case shall a two-story and attic building be converted into a three-story building thereby.

657. **Frame Buildings Carried to a Uniform Height.)** Where the different parts of a frame building inside the fire limits are of different heights a one-story portion may be raised to the height of two stories, provided the greatest height thereof does not exceed the limits of height prescribed in this chapter for frame buildings, and provided, that no room in the existing building or in the addition thereto shall violate the requirements of this chapter for habitable rooms.

658. **Basement or Story Placed Beneath Frame Buildings.)** A frame building may be raised for the purpose of erecting a basement or story, or both, thereunder but the principal floor of such frame building shall not be raised to a higher level than sixteen feet above grade of the sidewalk upon which such premises abut. The walls inclosing such basement or story shall be of masonry and not less than twelve inches thick, excepting that when a one-story frame building is raised and has a basement only built thereunder, the masonry wall of such basement may be eight inches thick above grade and twelve inches thick below. The foundations of such walls shall be constructed as provided in this chapter. Provided, however, that no frame building shall be raised for the purpose of constructing a basement or story, or both, under the same to a greater height to the top of its roof than that elsewhere herein given as the maximum height above grade for frame buildings. The thickness of walls herein-above required shall also apply to brick walls in new frame buildings.

659. **Chimneys in Frame Buildings—Chimney Flues Through Partitions.)** (a) Chimneys in frame buildings shall be built of brick or stone or concrete blocks, and brick chimneys less than eight inches thick and stone or concrete chimneys shall have flue linings of baked fire clay, provided that the walls of no flue shall be less than five inches thick including the lining. All joints shall be well filled with mortar and neatly pointed on the outside. The wood framing of frame buildings shall be trimmed around chimneys in such manner as not to come within two inches of the same.

(b) Metal smoke pipes or tile flues shall not extend through the floors or through the ceiling or roof of any building; and where such smoke pipes or tile flues pass through partitions the woodwork of such partitions shall be protected by a sheet metal ventilated tin thimble at least twelve inches greater in diameter than the diameter of the flue.

660. **Lot Lines—Requirements as to—Number—Dimensions.)** Frame buildings excepting sheds not exceeding three hundred square feet in area shall not be built nearer than one foot to any line of the lot upon which they are built, street and alley lines excepted, except as hereinafter provided. It shall not be lawful to erect a frame building wider than forty feet nor deeper than seventy feet, unless such building be divided by a fire wall or fire walls built of incombustible material and of a thickness of not less than four inches and of construction to be approved by the Commissioner of Buildings, so that no more than two thousand eight hundred square feet of superficial area shall be contained in any section or part of such building, unless closed by such fire wall, and if openings are inserted in such fire walls, then such walls shall be built of brick not less than eight inches thick, and such openings shall have doors as described in Section 573. Each section of such buildings shall be regarded as a separate building for the purpose of determining the number and construction of its stairways and means of egress. If more than one frame building is built in the direction of the depth of any one lot, such buildings shall not be built with a less distance than ten feet between them, except where both buildings are used for living purposes, and in that case the distance shall be governed by Sections 439 and 440 of this chapter.

661. **Sheds—Open Shelter—Height of Walls and Foundations—Enclosed.)** (a) Except as hereinafter provided, open shelter sheds not exceeding eight hundred square feet in area may be erected within the fire limits, provided they have roofing of incombustible material and the highest point is not over fifteen feet above the ground, and provided that the roofs be supported on sufficient posts or piers; provided, however, that such sheds may be built with an area not to exceed sixteen hundred square feet if they are kept at least twenty-five feet from any lot line and any other building or structure. Such sheds shall have no combustible enclosing walls or wooden floors, except that a floor of two-inch planking laid directly upon the ground may be used. Such sheds shall only be erected upon the rear of the lot, and not more than one such shelter shed or any other shed shall be erected on any lot of twenty-five feet in width.

(b) If it is desired to enclose an open shelter shed, the enclosing walls shall be made of brick, hollow tile, or other incombustible material, and such walls shall have foundations extending to solid ground and at least four feet below the surface of the ground.

) Open shelter sheds may be erected
ide the fire limits not to exceed twenty-
t hundred square feet in area and sub-
to the approval of the Commissioner of
dings: provided, however, that shelter
s which comply in other respects with
requirements of this section, may be
not to exceed nine thousand square
in area where such sheds are located at
twenty feet distant from any other
cture and from any lot line.

2. **Sheds—Coal, Brick, Stone, Cement Salt Sheds and Sheds for Icing Cars ng Railroad Tracks and Navigable ams.)** Open shelter sheds to be used the storage or handling of coal, brick, e, cement, salt or such commodities h are incombustible, or for the icing of . may be erected within or without the limits upon, along or adjacent to steam oad tracks, or along or adjacent to gable waters; provided, such sheds shall incombustible roofing and shall not ex- 35 feet in height from the ground to highest point of the roof; provided, fur- , that said sheds shall be located at 25 feet distant from any other struc- and from any side lot line. If it is red or intended to enclose any such s, the enclosing walls shall be of in- bustible material. No such shed shall built upon any lot or parcel of ground ting upon any street within 75 feet of building used exclusively for residence poses, unless the consent of the owners he majority of the frontage on both sides uch street between the two nearest in- cting cross streets shall first have been ined by the person, firm or corporation ring to erect and maintain such shed. said written consents shall be filed with Commissioner of Buildings before a per- shall be issued for such shed.

3. **Ice Houses.)** (a) Houses within the limits to be used exclusively for the ge of ice, of a floor area not to ex- nine thousand square feet, may be con- ted of wood with incombustible roofing, walls to be enclosed with an envelope ncombustible material; eight-inch brick ile or approved cement concrete walls proper foundations of masonry shall be for such envelopes.

) Houses to be used exclusively for the ge of ice, located outside of the fire s and contiguous to any lake and six red feet from any other building, except lings used in connection with the con- of said business, may be constructed of e with incombustible roofing, and the area of any such building shall not ex- eighty thousand square feet, unless the ling is divided by a solid wall of ma- y for each additional 80,000 square feet loor area, or fractional part thereof; shall extend at each end not less than foot beyond the enclosure of said build- and such wall shall be subject to the oval of the Commissioner of Buildings.

) Houses to be used exclusively for the ge of ice, located outside of the fire s, and contiguous to railroad tracks not within one hundred feet of any r building, may be constructed of frame incombustible roofing, and the floor area ay such building shall not exceed 20,000 re feet unless the building is divided by lid wall of masonry for each additional 0 square feet of floor area or frac- l part thereof; said wall shall extend ast one foot beyond the enclosure of said ling on each end and shall be approved e Department of Buildings.

) All dividing walls must extend gh and above the roof of any building hich they are built to a distance of three and must be covered with incombusti- coping. No dividing wall shall be of less thickness than twelve inches at any point thereof.

664. **Lumber Yards—Not to Be Located Near Residence Except by Consent.)** No person or corporation shall establish, maintain, conduct, or operate any lumber yard or place where new or second-hand lumber is kept for sale or is stored for seasoning or drying on any premises fronting on any street in any block where two-thirds of the buildings on any street surrounding any such block are used exclusively for residence purposes, unless the written consent of the owners of a majority of the frontage on both sides of all the streets surrounding the block in which it is proposed to locate, establish, conduct or maintain such lumber yard or place, be first obtained by the person or corporation desiring to establish, maintain or operate such lumber yard or place, consenting to the issuance of a permit from the Department of Buildings and also consenting that a license for the establishment, keeping or maintenance of such lumber yard or place shall be issued by the city. Such written consent shall accompany the application for a license and building permit made by such person or corporation.

665. **Storage of Lumber Near Planing Mill or Private Residence, Tenement House or Hotel.)** No lumber shall be piled for the purpose of storing, seasoning or drying the same, within fifty feet of any planing mill or wood working manufactory, nor within one hundred feet of any private residence, tenement house or hotel, unless the same has been erected since the establishment of such yard.

ARTICLE XVIII.

Stairways.

666. **Stairways, Number—Location—Construction.)** (a) Fireproof office buildings existing at the time of the passage of this ordinance which are equipped either with one stairway and two or more stairway fire escapes or with two stairways and one or more stairway fire escapes, shall not be required to have additional stairways or stairway fire escapes.

(b) Except as otherwise expressly provided in this Article, it shall be unlawful to construct or maintain any building or structure of Classes I, II and VII unless its stairway or stairways comply with the following provisions:

(c) In every existing building of ordinary construction having an area greater than 9,000 square feet or of mill or slow-burning construction greater than 12,000 square feet, there shall be not less than three stairways. The width of stairs shall be at least eighty per cent of the width of stairs as computed by the formulæ given herein and in no case less than twelve feet.

(d) Every building shall have at least one stairway from the ground to the top floor and one stairway from the lowest basement or cellar to the street grade, and no stairway shall be less than three feet in width.

(e) The width of stairs required for a building shall be constructed as the total width of all stairways required on the building. Stairs shall be measured between the wall and handrail for a single stair and between handrails where two or more handrails are required by this chapter.

(f) In buildings of Class I and Class IIa the width of stairs and fire escapes required for a building shall be determined by the floor area measured on the third floor of the building and such area shall not include walls, columns, stairs, elevator shafts, well holes, chimneys and corridors. In all cases where the building is less than three stories in height the width of stairs shall be

determined by the floor area of the second floor as hereinafter specified.

667. **Stairs—Number and Width of in Classes I, II and VII.)** (a) In buildings of Class IIb, Class IIc and Class VII the number and width of the stairs and fire escapes shall be determined by the area of that portion of the third floor not occupied by walls, columns, stairs, elevator shafts and well-holes.

In buildings of Class I, II and VII the number and width of stairs required shall be as follows:

(b) In Ordinary Construction.

With floor area of 5,000 square feet or less, two stairways;

With floor area of 5,000 to 9,000 square feet, three stairways.

(c) The width of stairs required in buildings of ordinary construction shall be computed as follows:

The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in square feet and multiplying the remainder by twelve and dividing the product by 1,000 and adding 72 inches to the quotient, expressed in the formula as follows:

$$72 \text{ inches plus } \frac{(\text{area}—3000) \text{ times } 12}{1{,}000}$$

(d) In Mill or Slow-Burning Construction.

With floor area of 6,000 square feet or less, two stairways.

With floor area of 6,000 to 12,000 square feet, three stairways.

(e) The width of stairs required in buildings of mill or slow-burning construction shall be computed as follows:

The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in feet and multiplying the remainder by eight and dividing the product by 1,000, and adding 72 inches to the quotient; expressed in the formula as follows:

$$72 \text{ inches plus } \frac{(\text{area}—3{,}000) \text{ times } 8}{1{,}000}$$

(f) In Fireproof Construction.

With floor area of 7,000 square feet or less, two stairways.

With floor area of 7,000 to 15,000 square feet, three stairways.

With floor area of 15,000 to 21,000 square feet, four stairways.

With floor area of 21,000 square feet and over, five stairways.

(g) Provided, however, that in fireproof buildings having an area of 21,000 square feet or more only four stairways shall be required if such building is completely equipped with an approved automatic sprinkler system.

(h) The width of stairs required in buildings of fireproof construction shall be computed as follows:

The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in feet and multiplying the remainder by six and dividing the product by 1,000, and adding 72 inches to the quotient; expressed in the formula as follows:

$$72 \text{ inches plus } \frac{(\text{area}—3{,}000) \text{ times } 6}{1{,}000}$$

(i) Provided, however, that where buildings of Class I are of fireproof construction and are used solely for storage warehouse purposes and the number of persons employed on any one floor does not exceed the number specified hereafter in this section they shall comply as to number of stairways as follows:

With floor area less than 8,000 square feet where not more than ten persons are employed on a floor, two stairways.

With floor area greater than 8,000 square feet and less than 15,000 square feet where not more than fifteen persons are employed on a floor, three stairways.

With floor area greater than 15,000 square feet where not more than twenty persons are employed on a floor, four stairways.

(j) The width of stairs shall be computed as follows:

The width of stairs in inches shall be equal to the result obtained by deducting 3,000 from the floor area of the building in feet and multiplying the remainder by four and dividing the product by 1,000, and adding 72 inches to the quotient; expressed in the formula as follows:

$$72 \text{ inches plus } \frac{(\text{area}—3{,}000) \text{ times } 4}{1000}$$

668. **Stairs—Other Requirements.)** (a) The width of stairway fire escapes and three-quarters of the width of sliding fire escapes required by this chapter may be deducted from the width of stairs required.

(b) Stairways shall be located as far from each other as practicable. The bottom of each stairway shall be in the immediate vicinity of the top of the stairs leading to the next lower story and the line of travel from stairway to stairway shall be direct and easily accessible each to the other. At least one stairway shall extend to the roof of every building. In Classes I, II and VII, the whole number of stairways required for each building shall be complete in every respect from the first to the topmost story.

(c) Every story below the street grade shall have not less than two stairways to the first story and each such stairway shall be not less than three feet wide, but where a basement or cellar is used for the retail sale of goods the stairway from such basement or cellar shall in number and aggregate width comply with the requirement of this section for the first four stories above sidewalk grade.

(d) Where two areas of the same building adjoin and are separated by fireproof dividing walls they may have a stairway in common, provided such stairway is not less than five feet wide and is inclosed in all stories of the building by fireproof walls in non-fireproof buildings and by fireproof partitions in fireproof buildings; and where the stairways and landings are built as required by this chapter for buildings of fireproof construction, and where the doors, frames, sashes and casings, and the glazed portion thereof are built as described in Sections 572 and 573 then in such case such stairway may be considered as equivalent to one open stairway from each such area, and where such stairway provides exit from only one floor area such stairway may be considered as equivalent to two open stairways but in no case shall there be less than two stairways in any such building except as otherwise provided in this chapter.

(e) Where adjoining buildings or buildings on opposite sides of an alley or other open space, and of the same class, used by the same person, firm or corporation, are connected by fireproof bridges or passageways with fireproof doors at each end, or by fireproof doors on each floor built and equipped as required by this chapter for dividing wall doors if such bridge or passageway or fireproof door is located as far as practicable from the stairways in both said buildings, then said bridge or passageway or fireproof door may be considered to be equivalent to a stairway for each of the two areas.

(f) In buildings of Class I, II and VII where an interior stairway and its stair hall in each story and on the ground floor leading toward or connecting with a public thoroughfare, is inclosed in all stories of the building by fireproof partitions built as required by this chapter, and where the

stairways and landings are built as required by this chapter, and where the floors of all stair halls and hallways leading to the entrance are built entirely of fireproof and incombustible material as required for buildings in this chapter and where the doors, frames, sash, casings and wired glass thereof are built of incombustible material as described in this chapter, then such stairway shall be considered the equivalent of two stairways or a stairway and a fire escape; provided, however, that if such stairway is considered the equivalent of two stairways the building must be equipped with a stairway fire escape or fire escapes as is required by this chapter.

(g) Exterior stairways in buildings of Class I, II and VII built entirely of steel and iron, having ice-proof treads not less than ten inches wide from nosing to riser and a riser of eight inches or less for each riser, and otherwise made as required for stairway fire escapes in this chapter and where such stairway fire escape extends from the inside grade to the top floor of the building or is supplied from the second floor to the ground with a counterbalanced section and has a steel ladder from the top landing to the roof, then such stairway may be considered the equivalent of one interior stairway and one stairway fire escape if the width of such stairway and that of the one or more stairways in the building equals the width of stairs required by this chapter; provided, that in such case the respective floors, door sills, and stairway platforms are flush, and that the doors do not obstruct the stairs or platforms and that the doors are each at least 90 per cent of the width of said stairway and that the windows, doors and frames passed by such stairway and platforms are built of incombustible material and wired glass.

(h) In buildings of Class I not more than three stories in height, a stairway fire escape not less than three feet wide located and built as required by this chapter for such fire escape and placed as far as practicable from the stairway, may be considered as a stairway and may be deducted from the "width of stairs" required for the building.

(i) The width of different stairways need not be alike, and for each four stories or fractional number of stories of the building above the first four stories each stairway may be reduced six inches, but no stair in a Class VII building shall be less than three feet in width.

(j) Stairways which are less than three feet three inches wide shall have not less than one hand rail and stairways which are more than three feet three inches wide shall have not less than two handrails. Stairways which are over eight feet wide shall have double intermediate handrails with end newel posts at least five and a half feet high.

(k) Stairways hereafter erected shall not be spiral stairways or have any winders. Provided, however, that circular or elliptical stairways may be used if the width of treads one foot from the center of the handrail next to the well-hole is nine and one-half inches, including nosings.

(l) Stairways shall not have risers more than eight inches high nor treads less than ten inches wide, inclusive of nosings.

(m) The bottom of any counter-balance stairway or ladder fire escape hereafter erected on any public thoroughfare when raised shall be not less than fourteen feet above the pavement or surface of the street or alley.

(n) The location of every stairway required by this article shall be subject to the approval of the Commissioner of Buildings.

ARTICLE XIX.

Fire Escapes.

669. **Fire Escapes—Number and Location.)** (a) It shall be unlawful for any person, firm or corporation to construct or maintain any building of Classes I, II, III, VI, and VII within the city, unless the same shall be equipped with fire escapes as follows:

(b) Every building four or more stories in height, except such as is used exclusively for a residence for one family shall have one or more incombustible sliding or stairway fire escapes, as required by this chapter, except as otherwise herein provided.

(c) There shall be at least one stairway fire escape constructed as required by the provisions of this chapter for each 250 persons, or fractional part thereof, who occupy any floor of any building habitually and daily or for whom working, sleeping or living accommodations are provided on any one floor above the third floor of any building or structure.

(d) Buildings of Ordinary Construction Shall be Equipped with Fire Escapes as Follows:

With floor area of 6,500 square feet or less, one 24-inch stairway fire escape.

With floor area of 6,500 square feet to 9,000 square feet, two 24-inch stairway fire escapes.

(e) Buildings of Mill or Slow-Burning Construction Shall be Equipped with Fire Escapes as Follows:

With floor area of 8,000 square feet or less, one 24-inch stairway fire escape.

With floor area of 8,000 square feet to 12,000 square feet, two 24-inch stairway fire escapes.

(f) Buildings of Fireproof Construction Shall by Equipped with Fire Escapes as Follows:

With floor area of 10,000 square feet or less, one 24-inch stairway fire escape.

With floor area of 10,000 to 20,000 square feet, two 24-inch stairway fire escapes.

With floor area of more than 20,000 square feet, three 24-inch stairway fire escapes.

(g) Fireproof Warehouse Buildings Shall be Equipped with Fire Escapes as Follows:

With floor area of 12,000 square feet or less, one 24-inch stairway fire escape.

With floor area exceeding 12,000 square feet, two 24-inch stairway fire escapes.

(h) A fireproof bridge built as described in Section 668 and connecting each floor of two neighboring buildings occupied by the same person, firm or corporation, shall be considered the equivalent of a fire escape, or of an interior stairway, but not the equivalent of both.

(i) In buildings of Class II there shall be a stairway or a fire escape as near as practicable to the end of each corridor, and where a corridor is endless the stairs and the fire escapes shall be located around and connected to said hall or corridor at distances approximately equal to each other.

(j) The openings leading to fire escapes on hospitals shall be flush with the floor leading to the fire escape which may be inclined not more than 2½ inches vertical to 12 inches of horizontal measurement, and shall be constructed and maintained with no obstructions thereon.

(k) In buildings hereafter erected wherever stairway fire escapes are considered the equivalent of an interior stairway or as taking the place of any of the "Width of Stairs" required by this chapter, there shall be a door or casement window leading to such fire escape from each floor. Windows and doors to such fire escapes shall not be less than 24 inches in width and not less than 72 inches in height. The sill of such windows or doors shall not be more than 24 inches above the floor, unless a stair is built leading to the same.

(l) Where a building is divided into separate areas, each such area shall be con-

sidered as a separate building and shall be equipped with stairs and fire escapes as is required for buildings by this chapter, unless otherwise herein provided.

(m) Exterior stairway fire escapes built as required by this chapter and having treads not less than 10 inches wide from nosing to riser and risers not more than 8 inches in height and having stairways extending from the inside grade to the top floor of the building or having a counterbalance section from the first story to the ground and a steel ladder from the top landing to the roof, shall be considered the equivalent of one interior stairway and one stairway fire escape, if the width of such stairway fire escapes with that of one or more stairways in the building equals the "Width of Stairs" required for the area of the respective buildings by this chapter.

(n) Where an interior stairway and its stair hall and other enclosing walls are built entirely of fireproof materials and where the doors of said stair halls are automatic closing fire doors; and where such stairway and the stair hall has at least one side on a street or alley or court, and where not less than 50 per cent of the area of the street or alley or court wall is open and unobstructed to the outer air; and where the stairs extend from the ground to the roof; and where there are doors as wide as the stairway opening outward from a floor or landing, level with the street, alley or court, or with the floor of a fireproof tunnel at the foot of such stairway, and if a court or fireproof tunnel, then where the floor of such court or fireproof tunnel is level and unobstructed, and not less than double the width of such stairway, and in any case not less than eight feet in width, and where such court or fireproof tunnel extends from the doors at the base of such stairway to a public alley or street and if the floor of said court or fireproof tunnel is not level with such alley or street, then where there are stairs not less than six feet wide, leading from the floor of the court or fireproof tunnel to a street or alley, and where said last mentioned stairs are on private property; and where the stairways comply in all respects with the provisions of this chapter, then such stairway shall be considered as a stairway fire escape.

(o) In buildings not more than two stories in height one stairway may be omitted if the building is equipped with a three-foot stairway fire escape built as required for fire escapes in this section with counterbalance drop and placed as far as practicable from the remaining stairway.

(p) Where fireproof buildings have a frontage upon public alleys or have courts of an area of not less than 320 square feet, and where such courts lead directly to a public thoroughfare, fire escapes may be permitted to be erected on such courts or such alleys and shall not be required to be erected upon the street fronts of such buildings. Such fire escapes shall be located as far as possible from stairways in the buildings, and where it is possible to erect the fire escapes on an alley or in a court they may be thus erected subject to the approval of the Commissioner of Buildings.

(q) In fireproof buildings of Class IIa, fire escapes may be located in light courts of fifty feet in the least dimension, having no opening onto a street or alley, but such fire escape must be connected with a stairway of the building at a level no higher than twenty-five feet above finished grade at the building, said stairway to terminate at the first floor level in a public corridor, giving direct egress from the building.

(r) Such fire escapes shall not be considered as part of the width of stairs as defined in Section 666 of this chapter for such buildings unless that portion of the stairway used in connection with the fire escape is increased by the width of the fire escape, from their junction to the ground.

Hospitals two or more stories in height shall be provided with one or more stairway fire escapes not less than 40 inches between handrails. Sliding fire escapes shall have a radius or witdth of not less than 42 inches. Sliding fire escapes shall not be built on public thoroughfares and shall deposit the person from same not more than twenty-four inches from the surrounding ground, and sliding fire escapes on Class VIII buildings shall be constructed, located and maintained in accordance with the provisions relating to Class VIII.

Wherever stairway fire escapes are considered by this chapter to be the equivalent of an interior stairway or as taking the place of any of the width of stairs, there shall be a door leading to said fire escape from each floor. Such door shall not be less than 24 inches in width and not less than 72 inches in height. The sill of such door shall not be more than 24 inches above the floor and the door shall be as wide as the stairway required on the fire escape. Where the sill is more than 24 inches from the floor, a small stairway shall be built from the floor to the window sill with treads not less than 10 inches wide and risers not more than 9 inches in height.

(s) A stairway fire escape placed on an exterior wall adjacent to a dividing or party wall shall be considered as a stairway fire escape for each building area to which it is adjacent. In such cases there shall be at least one door or window from each building area leading to the fire escape platform, and the width of each such fire escape shall not be less than 36 inches.

(t) All fire escapes shall be located and constructed to conform to the building for which they are respectively intended.

(u) If any building used wholly or in part for the purposes of Class VII be equipped with automatic sprinklers, and be connected with another building similarly used, and distant not less than twenty-five feet and used by the same occupant, by a fireproof bridge or passageway similarly equipped, then each such tier of bridges or passageways shall be held to be equivalent to and take the place of one outside stairway fire escape on each of the buildings so connected.

670. **Stairway Fire Escapes—Fees—Erection of—Location—Component Parts.)** (a) The Commissioner of Buildings and his assistants shall determine upon the location of all stairway fire escapes before erection of same is commenced.

(b) Before the work is commenced a permit shall be obtained from the Commissioner of Buildings for which a fee of $2.0 shall be exacted.

(c) No permit for a stairway fire escape more than twenty-four inches in width shall be granted unless a detailed plan for the fire escape, approved by a licensed architect or a structural engineer, is submitted to the Commissioner of Buildings, and a copy of such plans shall be left on file with said Commissioner.

(d) All anchors for stairway fire escapes shall, wherever possible, pass through the wall of building and be secured on inside of same. Where it is possible to anchor through walls, anchors shall be put in wall not less than fifteen inches at an angle of thirty-five degrees. On buildings of steel construction, where walls are less than twenty inches in thickness there shall be steel channels at least four inches wide set on inside of building from column to column and bolted or riveted to columns, and anchors shall be bolted on inside of channels.

(e) Anchors for a platform four feet two inches or less in width shall be made of one inch square iron; over four feet two

inches and not over six feet, shall be one and one-fourth inch square iron, with brace; over six feet shall be one and one-half inch square iron with brace. All anchors shall be turned up not less than eight inches at the outside of the platform on which to bolt the post.

(f) Braces shall be the same thickness as the anchors. The spread of the braces shall be the width of the platform. Where the platforms are over five feet in width, anchors shall have double braces, one to the outside and one to the center of the platform.

(g) Platforms shall be not less than fifty inches wide at ends; passageways shall be not less than twenty-four inches between buildings and railings. Platforms shall be not less than five feet in length. The frames and crossbars shall be made as provided in this chapter. Platforms shall have clips at each end bolted to anchors. No door or window or shutter shall open so as to obstruct in any way the free passage on or along a platform or a stairway fire escape.

(h) All stairway fire escapes for apartment buildings, hotels, boarding houses, factories and office buildings, where there are less than 100 people on any one floor, shall be not less than two feet wide between hand rails. Stringers for a 24-inch stairway fire escape shall be not less than 2 inches by ⅜ inch set 1½ inches apart. Where stairway fire escapes and their balconies and supports are designed and constructed in accordance with the provisions of this chapter relating to materials permitted for such stairway fire escapes, balconies and supports, so as to sustain a load of 100 pounds per square foot, they may be built of steel channels, angles, or I-beams, but when so constructed, they shall comply with the provisions of this chapter in all other respects. All stairway fire escapes for halls, churches, theaters, hospitals, schools, department stores and buildings where large numbers of people congregate shall not be less than three feet wide in the clear, and all passageways shall not be less than three feet wide in the clear. Stringers for a 36-inch stairway fire escape shall be made of two bars, 3 inches by $\frac{5}{16}$ inch, about one inch apart, or 4½ inches by ⅜ inch flat iron, or of steel channels, angles or I-beams; where over 12 feet in length, they shall have anchor and brace in the center. The tread shall be made of one-half inch square steel or iron, corner upwards, not to exceed 1⅝ inches center, riveted at ends to 2 by $\frac{5}{16}$ inch flat iron or steel. There shall be not less than four bars to a tread where treads are less than twenty-seven inches in length; where treads are over twenty-seven inches in length there shall be not less than six bars to a tread; there shall be a truss supporting treads made of bar iron 2 inches by ⅜ inches in thickness, riveted to bars of treads in center, supported by not less than two inches by seven-sixteenths inch rods bolted at each end of treads. All stairs shall have an incline of about forty-five degrees. The rise shall be not more than nine inches and the tread not less than nine inches.

(i) All stairs shall have three bar railings made of one-inch bar iron for top rail, and three-fourths inch bar iron for lower rail, and when such stairs are more than three inches from the wall of the building, there shall be one or more hand rails on the wall side of such stairs.

(j) All posts used for stair fire escapes shall be made of one and one-half inch angle or channel iron not less than three feet six inches high measured at right angles with the treads of such fire escapes, and shall have braces on the outside turned upwards and fastened to the frame of the balcony or stairs, which shall be not less than half way up the posts; all stair fire escapes shall extend to the ground, either by counterbalance drop or stairs. All ladder fire escapes shall have either extension ladder or counterbalance drop from the first story of said building to the ground or sidewalk. Their location, material and construction shall be subject to the approval of the Commissioner of Buildings. Where cables are used for counterbalance stairs they shall not be less than three-quarters of an inch in size and shall be well oiled or greased when hung up and shall be oiled or greased at least twice a year. All pulleys and cables holding counterbalance drop shall be covered at bracket so as to be protected from snow or ice.

(k) Wherever a stairway fire escape passes a window or door on buildings hereafter erected, the windows or doors shall be of wired glass and shall have metal frames and sash, and whenever such a fire escape passes above a window, door or other opening not fitted with wired glass and metal frames the said fire escape shall be protected on the under side by sheet metal of not less than No. 20 United States gauge opposite such opening and for a distance of three feet on each side thereof. The use of intermediate platforms shall be permitted on all buildings now built or hereafter constructed whenever it is possible by their use to avoid the necessity of stairway fire escapes passing windows. All fire escapes shall be painted with two coats of mineral paint when erected, one at the shop and one upon completion at the building, and they shall be painted at least once every year thereafter.

(l) Wherever it is impossible to erect stairway fire escapes according to the provisions of this chapter, plans shall be submitted to the Commissioner of Buildings showing the location, material and construction of such stairway fire escapes as are proposed to be built before a permit is issued for the same, and if it is found to be impracticable to locate and construct fire escapes in accordance with the provisions of this chapter and that fire escapes built according to the plan presented would afford safe and practical means of exit from the building on which they are to be placed, then the Commissioner of Buildings may in his discretion approve the same. All such fire escapes shall be inspected by the Commissioner of Buildings on their completion and if found to be safe, satisfactory and in compliance with said approved plans, a certificate shall be issued to such effect upon the payment of $2.00 to the City Collector. All fire escapes other than such as it is impossible or impracticable to build in accordance with the provisions of this chapter shall be inspected by the Commissioner of Buildings on their completion, and if found to be in compliance with the provisions of this chapter a certificate shall be issued by the Commissioner of Buildings upon the payment of a fee of $2.00 to the City Collector.

(m) It shall be unlawful for any person, firm or corporation to use any building until the provisions of this article shall have been complied with.

671. **Ladder Fire Escapes—When Permitted.)** Where a building of Class III or VI, not more than four stories in height has two flights of stairs leading from the ground to the top floor of the building and where also each occupant shall have access to at least two separate and distinct stairways located as required by the provision of this chapter from the top floor to the ground, a ladder fire escape may be used in lieu of the stairway fire escape required herein, where a counter balance drop is placed from the ladder fire escape to the ground.

672. **Specifications for Ladder Fire Escapes.)** (a) All single and double ladder fire escapes hereafter erected shall be in strict accordance with the following provisions:

(b) There shall be not less than three one-inch square wrought iron anchors to every five-foot balcony and not less than six for a twelve-foot balcony. Such anchors shall pass through the wall of the building and be bolted on the inside with a three-fourths by two-inch nut and three and one-half inch iron washer back of the nut, where the wall is not over twenty inches thick; but where the wall is over twenty inches thick anchors shall be inserted at least eight inches into the wall at an angle of thirty-five degrees.

(c) Where a ladder fire escape is permitted by this chapter, the side guards shall be two by three-eighths inch flat iron. All ladder fire escapes shall be seventeen inches or more in width in the clear. No old pipe nor rusted or defective material shall be used in the construction of ladder fire escapes. Rungs of ladders shall be of not less than one-half inch square iron with corners upward so as to give a safe footing. Rungs shall be riveted and shall be constructed with fourteen inch centers.

(d) The brace for the anchors shall be at least twenty inches spread and shall extend into the wall four inches; no other form of anchor shall be allowed except by special permit from the Commissioner of Buildings.

673. **Balconies—Construction of.)** All balconies hereafter erected shall be either steel or wrought iron and capable of sustaining a weight of one hundred pounds to the square foot. The balcony frame shall be made of not less than two-inch by two-inch by one-fourth inch angle iron which shall be securely riveted together with crossbars every two feet. Such bars shall be punched one-half inch square close to the top of the bar on two inch centers and one-half inch square iron bars shall be forced through the same. The crossbars shall be securely riveted to the angle iron frame. The crossbars for a balcony twenty-eight inches wide shall be two inch by three-eighths inch. Balcony frames over twenty-eight inches wide shall be made of not less than two by three-eighths inch iron and made to conform with the increased dimensions of iron in crossbars; for thirty-six inch balcony or more they shall be two and one-half inch by three-eighths inch. All balconies over this width shall have a two-inch "T" iron through the center of the balcony for the bars to rest upon; provided that such balconies and platforms of buildings of Class IIc may be built as described in Section 268 of this chapter. Such balconies shall have a substantial cast or wrought iron post every three feet bolted to the balcony. No balcony shall have less than three guard rails which shall be of wrought iron or new iron pipe not less than three-fourths inch in diameter and the ends shall be securely anchored to the wall of the building and shall be not less than ten inches on an angle of thirty-five degrees. Where stairway fire escapes and their balconies are designed and constructed in accordance with the provisions of this chapter to sustain a load of one hundred pounds per square foot, they may be built of steel channel angles or I-beams, but in such cases they shall comply with the requirements of this chapter in all other respects.

674. **Standpipes—Pumps—Axes, Etc., and Fire Fighting Apparatus.)** (a) In every building one hundred feet or more in height not provided with a three-inch or larger inside standpipe and in all buildings hereafter constructed of a greater height than seventy-five feet excepting buildings used for the purposes of Class IIc and Class V as herein elsewhere provided for, and in all buildings of a greater height than five stories now or hereafter used for hotels or public lodging house purposes, there shall be installed one or more four-inch standpipes, which shall extend from the basement to the roof and which shall be connected at the outside of the street or alley side of the building with a Siamese connection provided with iron cap for use of the fire department, and which shall be provided with one hose connection, with fire department thread, on the roof of said building, on each floor and in the basement thereof, with sufficient hose attached to reach any point thereof. The pattern, quality, installation and maintenance of such standpipe, hose and couplings, shall be subject to the approval of the Fire Marshal.

(b) In any of the buildings herein referred to which are completely equipped with an approved automatic sprinkler system it shall not be necessary to install inside standpipes as above provided for.

675. **Grain Elevators, Malt Houses and Cold Storage Houses—Steamer Connections —Sprinkler System.)** The interior of all grain elevators and malt houses of a height of fifty or more feet which are not of fireproof construction, and which have a capacity of two hundred and fifty thousand bushels or over; and the interior of all cold storage houses of a height of four or more stories which are not of fireproof construction and which have a ground floor area of ten thousand or more square feet, shall be completely equipped with either a dry or wet approved automatic sprinkler system with a feeder or riser pipe or pipes not less than four inches in diameter, leading from one or more Siamese steamer connections provided with iron caps, all of which shall be installed and maintained subject to the approval of the Fire Marshal.

676. **Grain Elevators, Malt Houses and Cold Storage Houses—Watch Service.)** (a) Grain elevators which are equipped with an approved fire alarm system, properly maintained; or grain elevators, malt houses and cold storage houses which are now equipped with standpipes and hose of approved quality, and which have outside standpipes not less than 2½ inches in diameter, and Siamese steamer connections properly located; and which are equipped with fire extinguishers, water barrels and pails distributed at proper intervals on all floors; and where some approved electric watch service and fire alarm system is maintained, and a watchman is employed to pull such stations at least once an hour every day and night of the year, all of which shall be subject to the approval of the Fire Marshal, will not be required to install additional inside standpipes as provided in the foregoing sections.

(b) It shall be unlawful for any person, firm or corporation to erect, use or maintain any building as a grain elevator, malt house or cold storage house unless such building complies with all the provisions of this section, or unless the Fire Marshal has such building examined and certifies to the Commissioner of Buildings that such building complies in all respects with the provisions of this section, and each day's unlawful use of such building, as above provided, shall be considered a separate offense.

677. **Steamer Siamese Connections.)** There shall be a Siamese connection at the bottom of each standpipe, so that two steam fire engines may be attached to it without interfering with each other. Such Siamese connection shall be within easy reaching distance from the sidewalk and be securely anchored to the wall of the building. The owner, agent, occupant or person in possession, charge or control of the premises

where such standpipe and Siamese connection are located, is hereby required to provide such covering or protection as is provided for in Sections 674 and 675 to the fittings of said Siamese connection for the purpose of keeping said fittings and connection clear and unobstructed. The protection or covering herein referred to shall apply to all inside and outside standpipes and connections to automatic sprinkler equipment now in existence or hereafter installed.

678. **Fire Escapes—Signs Indicating Location.)** Every building required to be equipped with metallic ladder fire escapes and wrought iron or steel balconies, sliding or stairway fire escapes, or other fire escape devices, shall have displayed in conspicuous places, on each floor of such building, notices sufficient in number and in plainly legible type at least six inches in height, indicating and showing the location of such fire escapes and the easiest way to reach them. If such notices be not displayed within thirty days after such equipment is installed and kept continuously displayed the Commissioner of Buildings shall cause the building to be closed and kept closed until the provisions of this section shall have been complied with.

679. **Stairs and Fire Escapes—Obstruction, Change in Construction.)** It shall be unlawful under any circumstances to close up or obstruct any stairways or fire escapes of any buildings or the approaches leading thereto. No change in the position or construction of any such stairway or fire escape shall be made, unless the permission of the Commissioner of Buildings shall first have been obtained.

ARTICLE XX.

Ventilation.

680. **Ventilation in Buildings of Classes IV, V, VII and VIII.)** (a) The air in any room used as an auditorium in buildings of Class IV and V, hereafter erected and the air in any room used as a classroom or assembly hall in buildings of Class VIII, hereafter erected, shall be changed, so as to provide each person for whom seating accommodation is provided in such auditorium, classroom or assembly hall with at least 1,500 cubic feet of air per hour.

(b) In buildings of Class VII, hereafter erected, on floors frequented by the public the air in such rooms shall be supplied at the following rates:

For each person in basement, 2,000 cubic feet per hour.

For each person in 1st to 3rd stories, both inclusive, 1,500 cubic feet per hour.

For each person in 4th story and above, except as hereinafter provided, 1,300 cubic feet per hour.

For each person in grocery departments and restaurants, 1,500 cubic feet per hour.

(c) For the purpose of determining the number of people on any floor in buildings of Class VII, in calculating the means of ventilation, the following floor area per person per floor shall be taken as the basis:

Basement, per person, 20 square feet of floor area exclusive of walls, stairs and elevators.

First story, per person, 20 square feet of floor area, exclusive of walls, stairs, elevators, and enclosed show windows.

Second story, per person, 50 square feet of floor area, exclusive of walls, stairs, elevators, and enclosed show windows.

Third story, per person, 60 square feet of floor area, exclusive of walls, stairs and elevators.

Fourth story and above per person, 80 square feet of floor area, exclusive of walls, stairs and elevators, except as hereinafter provided.

(d) Grocery departments and restaurants, per person, 40 square feet of floor area, exclusive of walls, stairs and elevators.

(e) The amount of carbon dioxide in the air of any such auditorium, classroom or assembly hall or space frequented by the public in Class VII buildings shall not be permitted to rise above 10 parts of carbon dioxide per 10,000 parts of air, measurements being taken at levels from two and one-half feet to eight feet above the floor, generally distributed, and the temperature in such spaces when artifically heated shall not exceed 68 degrees Fahrenheit. Relative humidity shall not be less than 45 degrees nor more than 80 degrees.

(f) The air in any room used as an auditorium in buildings of Classes IV and V, constructed prior to the passage of this ordinance, and the air in any room used as a classroom or assembly hall in buildings of Class VIII, constructed prior to the passage of this ordinance, shall be changed, so as to provide each person for whom seating accommodation is provided in such auditorium, classroom or assembly hall with at least 1,200 cubic feet of air per hour.

(g) The air in any rooms and floors in buildings of Class VII, erected prior to the passage of this ordinance, shall be supplied, by mechanical or other means, at the following rates:

For each person in basement, 1,600 cubic feet per hour.

For each person in 1st to 3rd stories, both inclusive, 1,200 cubic feet per hour.

For each person in 4th story and above, except as hereinafter provided, 1,040 cubic feet per hour.

For each person in grocery departments and restaurants, 1,200 cubic feet per hour.

(h) For the purpose of determining the number of people on any floor in buildings of Class VII, in calculating the means of ventilation, the following floor area per person per floor shall be taken as the basis:

Basement, per person, 20 square feet of floor area exclusive of walls, stairs and elevators.

First story, per person, 20 square feet of floor area exclusive of walls, stairs, elevators, and enclosed show windows.

Second story, per person, 50 square feet of floor area exclusive of walls, stairs, elevators, and enclosed show windows.

Third story, per person, 60 square feet of floor area exclusive of walls, stairs and elevators.

Fourth story and above, per person, 80 square feet of floor area exclusive of walls, stairs and elevators, except as hereinafter provided.

Grocery departments and restaurants, per person, 40 square feet of floor area exclusive of walls, stairs and elevators.

(i) The amount of carbon dioxide in the air of any such auditorium, classroom or assembly hall or space frequented by the public in Class VII buildings shall not be permitted to rise above 12 parts of carbon dioxide per 10,000 parts of air, measurements being taken at levels from two and one-half feet to eight feet above the floor generally distributed; and the temperature in such spaces when artificially heated shall not exceed 70 degrees Fahrenheit. The relative humidity shall not be less than 40 degrees nor more than 85 degrees.

(j) The word "auditorium" as used in this section in connection with buildings of Classes IV and V shall be construed as including the main floor, balcony and galleries.

(k) In buildings hereafter erected for or converted to the use of a factory, mill or workshop, the air shall be changed, except as hereinafter provided, so as to provide each person for whom working accommodations are provided therein with at least 1,500 cubic feet of air per hour.

(l) In buildings used for the purposes

of a factory, mill or workshop at the time of the passage of this ordinance, the air shall be changed, except as hereinafter provided, so as to provide each person for whom working accommodations are provided therein with at least 1,200 cubic feet of air per hour.

(m) In any building or room hereafter erected for or converted to the use of a factory, mill or workshop the amount of carbon dioxide in the air, except as hereinafter provided, shall not be permitted to rise above ten parts of carbon dioxide per 10,000 parts of air.

(n) In buildings or rooms used for the purpose of a factory, mill or workshop at the time of the passage of this ordinance, the amount of carbon dioxide in the air, except as hereinafter provided, shall not be permitted to rise above twelve parts of carbon dioxide per 10,000 parts of air. The measurements in each case above enumerated in this paragraph shall be taken at levels from two and one-half feet to eight feet above the floor, distributed generally; and the temperature in such spaces, when artificially heated, shall not exceed 68 degrees Fahrenheit, except as hereinafter provided; the relative humidity shall not be less than 40 degrees nor more than 85 degrees.

(o) The above provisions and standards as to ventilation shall not apply to storage rooms or vaults or any place where the manufacturing processes therein conducted would be materially interfered with, or where manufacturing processes therein conducted would produce considerable quantities of free carbon dioxide, except that the air in such rooms or vaults or in any places of manufacture shall not be permitted to become detrimental to the health of those who enter or work therein.

(p) No part of the fresh air supplied in compliance with the requirements of this section shall be taken from any cellar or basement.

(q) No person, firm or corporation, either as owner, proprietor, lessee, manager or superintendent of any factory, mill, workshop or any other building where one or more persons are employed, shall cause, permit or allow the same or any portion or apartment of any room in such factory, mill or workshop, to be overcrowded or to have inadequate, faulty or insufficient light or ventilation.

(r) No person shall be exposed to any direct draft from any air inlet, nor to any draft having a temperature of less than sixty degrees.

(s) All poisonous or noxious fumes or gases arising from any process, and all dust of a character injurious to the health of the persons employed, which is created in the course of a manufacturing process, within such factory, mill, workshop or laundry, shall be removed, as far as practicable, by either ventilating or exhaust devices.

ARTICLE XXI.

Elevators and Their Enclosing Walls.

681. **Elevators—Passenger and Freight—Permit for Construction—Fee—Penalty.)** (a) Before proceeding with the construction or alteration of any passenger or freight elevator, except such as are hereinafter specially exempted from the provisions of this chapter, a permit for such construction or alteration shall be obtained from the Commissioner of Buildings either by the owner or agent of the building in which such elevator is to be constructed or in which such alterations are to be made, or by the contractor who is about to construct or alter such elevator.

(b) It shall be unlawful for any such owner, agent, or contractor to permit or allow the construction of any such elevator or the making of such alterations, or to proceed with or in or about any of the work of construction or alteration of any such elevator until such permit shall first have been obtained. Such permit shall be issued by the Commissioner of Buildings after application shall have been made to him therefor by any such owner, agent or contractor, specifying the number and kind of elevators which it is desired to construct, or the nature of the alternations to be made and the location of the building or structure in which the same is or are to be placed or made. Such application shall be accompanied with such plans and specifications as shall be necessary to advise and inform said Commissioner of the plan of construction, type of elevator, kind of alterations and the location thereof. If such plans and specifications shall show that such elevator or elevators is or are to be constructed or erected or altered in conformity with the provisions of this chapter, the Commissioner shall approve the same and shall issue a permit to such applicant upon the payment of such applicant of a fee of two dollars for each elevator to be constructed, erected or altered, and such fee shall be known as a permit fee and shall not be held to cover the cost of any inspection which shall at any time thereafter be made of such elevator or elevators when constructed, or of any alterations made.

(c) All contractors or persons, firms, or corporations, engaged in the manufacture and work of installing iron doors on passenger or freight elevators, or of installing wire work enclosures around elevators shall secure a permit from the Commissioner of Buildings for the work on each such elevator, the fee for which shall be two dollars for each elevator.

(d) It shall be unlawful for any person, firm or corporation either as owner, lessee, contractor or agent of any building or structure in which any elevator or elevators are to be constructed or altered to proceed with said work without securing a permit as herein required for such construction or alteration, and no such permit shall be issued until such person, firm or corporation, lessee, contractor or agent shall have complied with all the requirements of this chapter.

682. **Enclosure of Elevator Shafts in Non-Fireproof Buildings.)** In all non-fireproof buildings hereafter erected all passenger elevators and all freight elevators, except such as are expressly excepted by this chapter, shall be inclosed in a wall of brick, tile or such incombustible material as may, from time to time, be approved by the Commissioner of Buildings as proper and suitable for the purpose; such inclosure shall extend from the foundation to the roof of such building, and shall be supported independently of the floor construction; provided, further, however, that the provisions of this section shall not apply to any non-fireproof building which is equipped throughout on every floor and in every room thereof and in all stairways, platforms, elevator shafts, elevator hoistways and well holes with an automatic sprinkler system approved by the Fire Marshal.

683. **Enclosure of Pits and Shafts in Basements.)** In all buildings heretofore or hereafter erected, whenever any elevator shaft extends down into a basement or subbasement, that portion thereof extending below the street level shall be inclosed in walls of brick, tile or other fireproof material, and the door openings in such inclosure shall be protected by incombustible doors. Where such elevator shafts do not extend down into the basement they shall be provided with fireproof pits at the lowermost floor level above which they serve, and such pits shall have no openings except for cables or other elevator equipment.

684. **Enclosure of Dumb Water Shafts—Materials.)** In all non-fireproof buildings hereafter erected, the dumb waiter shafts shall be inclosed with brick, tile, reinforced concrete, or cement plaster not less than two inches thick or metal studs and lath.

685. **Doors—On Elevators.)** In all elevator shafts which are herein required to be enclosed with fireproof walls, the door openings shall be equipped with doors of incombustible material, which shall be made to open from the outside by means of a key or other device satisfactory to the Commissioner of Buildings.

686. **Hatch Doors—Freight Elevators.)** Elevators, used exclusively as freight elevators constructed and in operation at the time of the passage of this ordinance need not have enclosing walls, but in all such cases there shall be at every floor through which such freight elevators pass automatic hatch closers or automatic doors, made in such manner that they will fully close each well hole when the temperature in such well hole exceeds 140 degrees Fahrenheit; and it shall be the duty of the owner, agent or person in possession, charge or control of a building in which such elevator is maintained to keep such hatch closers or doors at all times in good working order. Such automatic hatch closers shall be examined by the Commissioner of Buildings and the Fire Marshal and if said officials shall find that such doors will automatically close when the temperature at or near such doors exceeds 140 degrees Fahrenheit, and that the conditions of construction and operation of such doors or hatch closers are such that there is no reasonable probability of their getting out of order and failing to operate when required, and that in their construction or operation there is nothing that is likely to cause accidents to or interference with the elevator service in such hatch holes which they were intended to close, and that the building in which such freight elevator is in use is equipped with stairways, fire escapes and passenger elevators sufficient to offer ample means of escape from such building in case of fire, for all persons employed or for all persons in such building, then, and in such case only, shall the use of such hatch doors or closers be permitted. All freight elevators in non-fireproof buildings shall comply with the preceding requirements of this section, or shall have inclosing walls of incombustible or fireproof construction. Such elevators are to be inspected semi-annually and oftener when, in the opinion of the Commissioner of Buildings, such inspection is necessary and such fees shall be paid for said inspection as otherwise provided in said chapter.

687. **Safety Device.)** (a) Every passenger and freight elevator now in operation or hereafter installed, except such as are hereinafter exempted from the provisions of this chapter, shall be provided with a speed governor and such other efficient device to secure the safe operation of such passenger or freight elevator, and to prevent the cab or car of such elevator from falling, and to secure the safety of the cab or car and its load in case it does fail, as may be required by the Commissioner of Buildings. Such speed governor and other devices shall be subjected to such a practical test as may be determined by the Commissioner of Buildings for the purpose of ascertaining the efficiency of such safety device.

(b) It shall be the duty of the Commissioner of Buildings to make such test of each and every device upon all elevators, and no elevator shall be permitted to be run until such test has been made.

688. **Safeguards for Elevators.)** (a) Where the counterweights travel in the same hatchway with an elevator car, the portion of the car contiguous to the weights shall be protected from the top to the bottom of the car by a suitable guard.

(b) All freight elevators shall be provided with a guard at least six feet high. All elevator cabs or cars, whether used for freight or passengers, shall be provided with some device whereby the car or cab may be held in the event of accident to the shipper rope or hoisting machinery or controlling apparatus.

(c) No passenger elevator hereafter erected shall be installed with a freight compartment either below or above the car.

(d) All hoistways, hatchways, elevator wells and wheel holes in factories, mercantile establishments, mills or workshops, shall be securely fenced, inclosed or otherwise safely protected, and due diligence shall be used to keep all such means of protection closed, except when it is necessary to have the same open, in order that the said hatchways, elevators or hoisting apparatus may be used.

(e) It shall be unlawful to erect or maintain an elevator where such elevator or its counterweight descends into any passageway or thoroughfare.

(f) There shall be directly under the sheaves at the top of every elevator hatchway, a grating of steel or heavy wire mesh properly supported by steel or iron and capable of sustaining a load of not less than 500 pounds.

(g) All counterweights hereafter installed shall have their component parts so fastened together as to prevent any piece or pieces from becoming detached from the guides should the counterweights be accidentally drawn to the top of the hatchway.

(h) Where drum counterweight cables run through or pass by the car counterweights to weights underneath, they shall be provided with a suitable covering to prevent their chafing and wearing on the counterweights.

(i) Where elevators other than handhoists and sidewalk elevators are not inclosed with fireproof or incombustible material, as is elsewhere herein specified in this Article, the well-hole of such elevator shall be enclosed with a wire guard not less than six feet high. The counterweights and the immediate space through which they travel must be protected from the floor to the ceiling with a wire guard or with other incombustible material. There must be on all elevators hereafter constructed a clear space of not less than two feet between the bottom of the hatchway and the level of the lower floor landing when the car is at its lowest position, and there must be a clearance of at least four feet from the top of the crossbeam of the car to the lower side of the grating under the overhead sheaves. Whenever there is conflict in regard to the manner of enclosing any elevator shaft or portion thereof between this section and Sections 682, 683 and 684, the provisions of the latter sections shall prevail.

(j) All passenger and freight elevators hereafter installed, except sidewalk or hand elevators, shall have an artificial traveling gas or electric light attached to the car and maintained in good working condition.

(k) All power driven elevtors hereafter constructed or installed shall have at least two hoisting cables for the cage and two cables for each counterweight. The lifting and counterweight cables shall have at least one full turn of the cable on the drum when the car has run its limit.

(l) It shall be unlawful to change a hand-hoist to a power-driven elevator without first making application to the Commissioner of Buildings for a permit for such change, and it shall be unlawful to connect an electric motor or any other appliance to the hand elevator machinery without the

approval of the Commissioner of Buildings.

(m) All elevators, except hand elevators operated by a pulley rope and sidewalk ram or chain hoist elevators, and elevators used in tunnels for freight service only, shall be equipped with a safety speed governor.

(n) Where ropes or cables are used to operate safety devices, a weight shall be properly attached to the same in such a manner as to insure the necessary tension on such rope or cables for proper performance of the safety devices.

(o) All elevators propelled by electricity shall be provided with an additional device not operated by a link belt or sprocket chain which will automatically stop the elevator machinery when the car has reached its limit of travel. It shall be unlawful to construct or maintain any elevator equipped with a sprocket chain or link belt device or devices connecting the operating device and controller.

(p) An emergency switch which will disconnect the current shall be provided in all passenger elevators hereafter installed which are operated by an electric controller car switch, and such cars shall be so constructed that they will automatically stop when the current is disconnected.

(q) The underside of the floors or other parts of a building which project into passenger elevator shafts shall be equipped with a smooth steel guard curved and sloped from the enclosure of said elevator to the edge of such projection for the width of the door to such elevator car and the slope of the guard plate shall not be less than sixty degrees with the horizon.

(r) The provisions of this section requiring the equipment of elevators with safety devices shall not apply to any hand hoists, elevator or hoist used solely for hoisting materials or tools in any building in course of construction, but the Commissioner of Buildings shall make such reasonable requirements as he may deem necessary for public safety in the operation of such hand hoists, elevators or hoists used solely for hoisting materials or tools in such buildings while under construction.

689. **Inspection—Test—Certificate to Be Posted.)** (a) Every elevator now in operation or which may be hereafter installed, together with the hoistway and all equipment thereof, shall be inspected under and by the authority of the Commissioner of Buildings at least once every six months, and in no case shall any new elevator be placed in operation until an inspection of the same has been made.

(b) It shall be the duty of every owner or agent, lessee or occupant of any building wherein any elevator is installed and the person in charge or control of any elevator to permit the making of a test and inspection of such elevator or elevators and all devices used in connection therewith upon demand being made by the Commissioner of Buildings or by a duly authorized Elevator Inspector within five days after such demand has been made.

(c) Whenever any such elevator has been inspected and the tests herein required shall have been made of all safety devices with which such elevator is required to be equipped and the result of such inspection and tests shows such elevator to be in good condition, satisfactory to the Commissioner of Buildings, and that such safety devices have been provided in accordance with the requirements of this chapter and are in good working condition and in good repair, it shall be the duty of the Commissioner of Buildings to issue or cause to be issued a certificate setting forth the result of such inspection and tests and containing the date of inspection, the weight which the elevator will safely carry and a statement to the effect that the shaft doors, hoistway and all equipment, including safety devices, are constructed in accordance with the provisions of this chapter, upon the payment of the inspection fee required by this chapter.

(d) It shall be the joint duty of the owner, agent, lessee or occupant of the building in which such elevator is located and of each person in charge or control of such elevator to frame the certificate and place same in a conspicuous place in each elevator.

(e) The words "safe condition" in this section shall mean that it is safe for any load up to the amount of weight named in such certificate.

(f) Where the result of such inspection or tests shall show such elevator to be in an unsafe condition or in bad repair, or shall show that the safety devices, or any of them, which are required by this chapter, have not been installed, or if installed, are not in good working order or not in good repair, such certificate shall not be issued until such elevator, its hoistway and its equipment or such device or devices shall have been put in good working order, satisfactory to the Commissioner of Buildings. The inspection fees herein required shall be paid either at the time application is made for inspection or upon the completion of such inspection and tests.

690. **Power of Commissioner to Stop Operation of Elevators.)** (a) Whenever any building or elevator inspector finds any passenger or freight elevator or any of its running parts or automatic devices or other equipment out of order, or in an unsafe condition, he shall immediately report the same to the Commissioner of Buildings, together with a statement of all the facts relating to the condition of such elevator or elevators.

(b) It shall be the duty of the Commissioner of Buildings upon receiving from any inspector a report of the unsafe condition of any elevator, to order and cause such elevator not to be used until the same shall have been placed in a safe condition, and it shall be unlawful for any owner, agent, lessee, or occupant of any building, wherein any such passenger or freight elevator is located within the city, to permit or allow any such elevator to be used after the receipt of a notice in writing from the Commissioner of Buildings that any such elevator is out of order or is in an unsafe condition and until said elevator has been put in a safe and proper condition as required by the provisions of this chapter.

ARTICLE XXII.

Storage of Oils.

691. **Construction of Buildings for Storage of Oils Hereafter Prohibited.)** (a) It shall hereafter be unlawful for any person, firm or corporation to build, construct or erect any building designed for the storage of crude petroleum, gasoline, naphtha, benzine, camphine, carbon oil, spirit gas, burning fluid, spirits of turpentine, coal oil, rock oil, earth oil, or any other liquid except such as will stand a test of one hundred and fifty degrees Fahrenheit according to the method of John Tagliabue.

(b) Buildings heretofore erected designed for the storage of the fluids mentioned in the preceding paragraph must conform to the following provisions:

(c) The walls shall be of brick, stone or concrete, and shall be not less than sixteen inches thick or more than sixteen feet high. The lower floor of such buildings shall be at least three feet below the grade of the adjoining street and shall be made of earth, concrete, or brick. The roof of such buildings shall be made of tile, metal or other incombustible material, and the outside walls of any such buildings having a flat roof shall extend at least eighteen inches above

the roof. The coping upon the roof of such buildings shall be made of incombustible material. Such buildings shall be detached from all other buildings and shall be properly ventilated. Where any such building shall be located less than twenty-five feet away from any other building or structure, the wall or walls of such oil storage building on the side or sides thereof within such distance of twenty-five feet from any other building or structure shall have no windows or other opening therein; provided, however, that if such building cannot be so constructed that no outside wall thereof shall be less than twenty-five feet away from any other building or structure, in such case, openings may be made in the wall of such building which is located farthest away from any other building or structure for the purpose of admitting light or providing means of access thereto or egress therefrom. If such opening be a window, the glass in such window shall be fire-resisting glass in metal frame, and such window shall be provided with a steel shutter.

(d) No such building shall be occupied for any purpose other than the storage of oils, and no person shall be permitted to use any such building as a sleeping apartment or dwelling place.

(e) Such buildings and the equipment thereof, including the protection of the doors and windows, shall be constructed according to plans and specifications submitted to and approved by the Commissioner of Buildings.

692. **Storage of Oils.)** (a) It shall be unlawful for any person, firm or corporation to keep or store crude petroleum, gasoline, naphtha, benzine, camphine, carbon oil, spirit gas, burning fluid, spirits of turpentine, coal oil, rock oil, earth oil, or any other liquid except such as will stand a test of one hundred and fifty degrees Fahrenheit, according to the method of John Tagliabue, in any quantity exceeding ten gallons, upon or in any building, structure or premises, within the City of Chicago, except in such a building or structure as has been heretofore constructed in accordance with the provisions of Section 691, or in such tanks as are provided for in Section 693 of this Article.

(b) Where ten gallons or less of any of the above-mentioned oils or fluids, except such as will stand the test above mentioned, are kept upon or in any building or structure within the city, they must be kept in safety cans made of not less than 24-gauge galvanized iron or other suitable metal approved by the Fire Marshal, with opening or openings protected by self-closing stops, and such safety cans must be of a type approved by the Fire Marshal.

(c) No gas, candle, oil or other like artificial light or lighted stove, gas grate or other open flame or electric switch or cut-out of any kind shall be allowed within fifteen feet of any receptacle or receptacles containing any of the oils or fluids mentioned in this Article, nor shall electric switches or cutouts be located closer than four feet to the floor in rooms containing such oils or fluids.

693. **Tanks for Storage of Oils.)** (a) Any person, firm or corporation desiring to use any space underneath the surface of the ground, or underneath any building in the City of Chicago, except in such a building or structure as was formerly authorized under the provisions of Section 691 of this Article, for the construction, maintenance or use of any tank thereunder for the storage of any one or more of the oils or fluids mentioned in Section 692, shall first obtain a permit so to do from the Commissioner of Buildings of the City of Chicago, and the applicant shall pay to the City Collector a fee of two dollars ($2.00) for each tank prior to the issuance of such permit, which fee shall cover the cost of the inspection thereof, and no such permit shall be issued without first being approved by the Fire Marshal of the City of Chicago, and said permit may be revoked by the Mayor at any time for a just cause.

(b) Applications for such permits shall be in writing, stating specifically the location, the space desired to be used, the length, breadth and depth, together with the measurement in feet from the surface of the ground to the top of such tank and shall contain the plans and specifications for the construction of said tank, its connections, fittings, openings and safety appliances.

(c) Tanks for the underground storage of the oils or fluids mentioned in Section 692 with the exceptions therein provided shall be made of galvanized steel, open hearth basic steel or wrought iron of a gauge depending upon the capacity, as follows: 14 U. S. gauge for capacities of 180 gallons or less; 12 U. S. gauge for capacities of 181 to 300 gallons; 7 U. S. gauge for capacities of 301 to 4,000 gallons; one-fourth inch with three-eighths inch heads for capacities of 4,001 to 10,000 gallons; three-eighths inch for capacities of 10,001 to 12,600 gallons. All portions of such tanks shall be either riveted, and soldered or caulked, or welded or brazed together and made oil-tight and shall be coated on the outside with tar, asphaltum or other rust-resisting material. Every such tank exceeding 4,000 gallons in capacity shall have a manhole.

(d) Tanks (other than portable filling tanks hereinafter mentioned, those located in buildings heretofore constructed under the provisions of Section 691 of this Article and those located beneath or attached to buildings as hereinafter provided in this section) shall be placed and maintained with the tops at least two feet under the surface of the ground and shall have no building or structure of any kind over or above them. When located not less than two hundred (200) feet away from any building or structure or from any street, alley or public way, dock, water front, lumber yard or any yard or place where combustible materials are kept or stored, such tanks shall contain not to exceed twelve thousand six hundred gallons each, and when located less than two hundred feet away from any building or other structure or from any street, alley or public way, dock, water front, lumber yard or any yard or place where combustible materials are kept or stored, shall contain not to exceed one thousand gallons each; provided, however, that the aggregate capacity of tanks located within thirty feet of any building shall not exceed five thousand gallons. No such tank shall have any openings or pipe connections, except on the top thereof, nor shall it be connected either directly or indirectly with any public or private sewer, drain or catch basin in the City of Chicago. All pipes leading to or from such tanks shall be of galvanized wrought iron with heavy galvanized cast-iron or brass fittings, protected against injury, and shall be so placed that the tops of such tanks shall be lower than the level of the lowest pipe in the building used in connection therewith, and all such tanks shall be so placed that no artificial light shall be required while filling. Each tank shall be provided with a filler pipe of galvanized iron or brass not less than one and one-quarter inches in diameter entering at the top of the tank and extending not less than four inches below the top of the tank, the upper end of which said filler pipe shall terminate in a locked screw cap or metal filler box, which must be kept securely locked at all times, except when such tank is being filled, and each such tank shall also be provided with a galvanized iron vent

pipe not less than one inch in diameter connected with the top of such tank and provided with a screen of thirty mesh brass wire at or near the tank connection, and said vent pipe shall be carried up to the outer air at least ten feet higher than the roof of any building in connection with which such tank shall be used and shall terminate in a goose neck spark protector, the opening of which shall be covered with a thirty mesh brass wire screen and which shall be located at least twenty feet from all windows in higher adjacent buildings. If there is no building within twenty feet of such tank, said vent pipe shall terminate in a locked screw cap or other device which shall be approved by the Fire Marshal. The installation of said tanks shall be subject to the supervision and approval of the Fire Marshal of the City of Chicago, and they shall not be covered up until the said Fire Marshal has inspected them and found that the tanks and their equipment comply with the provisions of this section and until said Fire Marshal has issued to the owner thereof a certificate to that effect.

(e) Tanks for the storage of one or more of the oils or fluids mentioned in Section 692 of an aggregate capacity of not more than three hundred gallons, may be installed beneath buildings. Every such tank shall be enclosed by a casing of concrete at least six inches in thickness and shall be so situated and constructed that the top of such tank shall be at least two feet below the upper surface of the lowest floor, which shall be constructed of concrete not less than six inches thick. The filling pipes of tanks installed underneath buildings as provided in this paragraph must terminate outside of the outer wall of said building in a locked screw cap or other device of a design which shall be approved by the Fire Marshal of the City of Chicago, and said screw cap or device must be kept securely locked at all times except when such tank is being filled, and where any such filler pipe runs to a sidewalk, alley or public highway it must terminate in a locked screw cap or other device of a design which shall be approved by the said Fire Marshal and which shall be set flush with the surface of the sidewalk, alley or highway, and provided with a locked iron cover, which must be kept securely locked at all times except when such tank is being filled. The filling pipe and the vent pipe of any such tank must be laid underneath the concrete floor of the building until they reach the outside of the outer wall of said building. Such tanks shall comply in all other respects with the provisions, conditions and requirements of the preceding paragraphs of this section; provided, however, that no such tank shall be constructed underneath any building any part of which is used for residence, hotel or lodging purposes. Such tanks must be supplied with pumps or other devices for the removal of the contents thereof which shall have been approved by the Fire Marshal of the City of Chicago. Each pipe connecting such tank with the pump or the device for the removal of its contents shall be of galvanized iron and must be so laid that no portion thereof is lower than its level at the point where such pipe is connected with the tank, and it shall be pitched upward from the tank to the pump or other device used for the removal of the contents of such tank, and said pipe shall be laid at least eighteen inches below the surface of the ground, and all exposed portions thereof shall be properly protected.

(f) Sealed portable filling tanks of a capacity of not more than sixty gallons may be used inside of garages for the storage and handling of any one or more of the oils or fluids mentioned in Section 692. Such tanks shall be constructed of not less than No. 7 U. S. gauge steel, supported on steel wheels not less than thirty inches in diameter with rubber tires, and provided with an approved pump or other device for the removal of the contents thereof, and a hose, of length not to exceed eight feet, through which the oil or fluid is to flow.

(g) Pressure tanks not exceeding six gallons oil capacity, constructed of not less than No. 18 U. S. gauge steel, and used in connection with lighting systems, approved by the Fire Marshal, may be placed above ground and attached to the outside walls of buildings.

694. **Oil Tanks Used in Connection With Engines; Gas Producers, Etc.)** (a) Tanks for storing oils or liquids which will stand a test of one hundred and fifty degrees Fahrenheit, according to the method of John Tagliabue, used in connection with engines, gas producers, furnaces, ovens or other oil burning equipments, must be constructed in accordance with the provisions of Section 693, and, if installed inside of buildings, must be limited to an aggregate capacity of 1,000 gallons, and must be placed beneath the lowest floor in the manner specified for oils and fluids mentioned in Section 692; provided, however, that an auxiliary tank of a capacity not exceeding ten gallons may be placed above the floor.

(b) Nothing in the provisions of this Article shall be construed as repealing any of the provisions of an ordinance for the storage of gasoline in the alleys of the city, passed by the City Council on the 11th day of March, A. D. 1907, pages 3456 to 3461, inclusive, of the Council Proceedings of said date.

ARTICLE XXIII.

Billboards, Signboards, Signs, and Fences.

695. **Billboards and Signboards on Buildings—Construction—Height.)** No billboard or signboard shall be erected or placed upon or above the roof of any building or structure within the limits of the City of Chicago; and it shall be unlawful for any person, firm or corporation to attach any billboard or signboard to the front, sides, or rear walls of any building, unless the same shall be placed flat against the surface of the building and safely and securely anchored or fastened thereto in a manner satisfactory to the Commissioner of Buildings.

696. **Size and Construction of Billboards and Signboards Erected Within Fire Limits Otherwise Than on Building's.)** The face of billboards or signboards erected within the fire limits as now defined or as they may hereafter be defined by ordinances of the City of Chicago, other than signboards and billboards referred to in Section 698 hereof, shall not exceed twelve feet in height, and the same shall be constructed of galvanized iron or some other equally incombustible material, except that the stringers, uprights and braces thereof may be of wood. All such billboards or signboards shall be securely anchored or fastened so as to be safe and substantial.

697. **Height and Distance From the Ground of Billboards and Signboards Erected Within the Fire Limits.)** It shall be unlawful for any person, firm or corporation to construct or erect any billboard or signboard, except those specified in Section 698 hereof, within the fire limits of the City of Chicago at a greater height than fifteen feet six inches above the level of the adjoining street. Where the grade of the adjoining street or streets has not been established, no billboard or signboard shall be constructed or erected at a greater height than fifteen feet six inches above the level of the ground upon which such billboard or signboard is erected. The face of every billboard or signboard within the fire limits shall be of incombustible material, but the supports and framework of the same shall

be of wood. The base of the billboard or signboard shall, in all cases, be at least three feet six inches above the level of the adjoining street. If, however, the level of the ground where the billboard or signboard is to be erected is above the level of the street, then the bottom of the face of the billboard or signboard must be at least three feet six inches above the level of the ground at the point where the board is to be erected. Every said billboard or signboard must be constructed and located in accordance with the provisions of this Article and shall be subject to the approval of the Commissioner of Buildings.

698. **Wooden Billboards or Signboards—Construction—Size—Exceptions.)** Billboards or signboards not exceeding twelve square feet in area may be built of wood or other combustible material, and such billboards or signboards shall be exempt from the provisions of this Article, except that they shall be safely and securely anchored or fastened and shall be so constructed, anchored and fastened that they will withstand the wind pressure specified in Section 703 of this Article. It shall be unlawful to erect any such square feet in area before a permit therefor has been procured from the Commissioner of Buildings, the application for which must include the plans and specifications of such board and its supports and fastenings. No such board or boards shall be more than

699. **Billboards and Signboards Erected Outside the Fire Limits—Construction—Size.)** It shall be unlawful for any person, firm or corporation to construct, erect or locate any billboard or signboard, except those specified in Section 698 hereof, outside the fire limits of Chicago at a greater height than fifteen feet six inches above the level of the adjoining street. Where the grade of the adjoining street has not been established, no billboard or signboard shall be constructed or erected at a greater height than fifteen feet six inches above the level of the ground upon which such billboard or signboard is erected. The base of the billboard or signboard shall, in all cases, be at least three feet six inches above the level of the adjoining street. If, however, the level of the ground where the billboard is to be erected is above the level of the street, then the bottom of the face of the billboard or signboard must be at least three feet six inches above the level of the ground at the point where the board is to be erected. The braces, supports and face of the billboard or signboard outside the fire limits may be made of wood, unless the billboard or signboard shall be erected or located so that any part of the face of said board is nearer than ten feet to any building or structure in which case the face of the same shall be constructed with incombustible material. Every such billboard or signboard shall be safely and securely constructed, anchored, fastened and located in accordance with the provisions of this article and shall be subject to the approval of the Commissioner of Buildings.

700. **Provisions of This Article Shall Apply to Other Similar Structures.)** The provisions of this article shall apply to other similar structures of like size and construction without regard to their use whether erected on or near the surface of the ground or anchored to, or fastened to any building or structure.

701. **No Billboard or Signboard Shall be Erected Without Permit.)** No billboard or signboard or other similar structure such as is described in this article shall be erected or maintained within the city unless a permit shall first have been secured by the person, firm or corporation desiring to erect or maintain such billboard or signboard from the Commissioner of Buildings to whom application for such permit shall be made; and such application shall be accompanied by such plans and specifications of the proposed billboard or signboard and location of same as are necessary to fully advise and acquaint the said Commissioner with the construction of such proposed billboard or signboard. If the plans and specifications accompanying such application shall be in accordance with the provisions of this article, said Commissioner shall thereupon issue a permit for the erection of such billboard or signboard upon the payment by the applicant of a fee as hereinafter fixed.

702. **Alteration and Repair of Billboards and Signboards.)** No material alteration of any billboard or signboard nor removal from one location to another shall be made except upon a written permit issued by the Commissioner of Buildings authorizing such alteration or removal; and such permit shall be issued upon application in writing made to such Commissioner by the owner of such billboard or signboard or by the person in charge, possession or control thereof, accompanied by a plan of the proposed alterations or repairs to be made and a written statement covering the proposed removal from one location to another and its reconstruction in the new location, which said alteration and repairs or removal shall be made in accordance with the provisions of this article and the ordinances of the City of Chicago. Where such plans, specifications and location are in compliance with the requirements of this article and are satisfactory to and approved by the Commissioner of Buildings, such Commissioner shall issue a permit upon the payment of a fee therefor as hereinafter fixed; but such alteration shall not be construed to apply to the changing of any advertising matter of any billboard or signboard, nor the refacing of the framework supporting same.

703. **Wind Pressure—Strength—Billboards Now Existing or Hereafter Constructed.)** All billboards and signboards now in existence, or hereafter to be constructed, erected or maintained, shall be made, constructed, erected and maintained of sufficient strength to withstand a wind pressure of twenty-five pounds per square foot of surface without stressing the material beyond the safe limit of stress given elsewhere in this chapter.

704. **Changes in Existing Billboards and Signboards.)** No surface billboard or signboard constructed or erected prior to the passage of this ordinance shall be maintained after six months from and after the passage of this ordinance where the height of such billboard or signboard exceeds seventeen feet, nor shall such billboard or signboard be maintained after such date, unless there is a clear space of at least three feet six inches above the level of the adjoining street. If, however, the level of the ground where the billboard or signboard is erected or maintained is above the level of the street then there must be a clear space of at least three feet between the bottom or face of the billboard or signboard and the level of the ground at the point where the billboard or signboard is erected or maintained.

705. **Duty of Commissioner—Owner's Name to Be Placed on Top of Billboard or Signboard—Annual Inspection.)** It shall be the duty of the Commissioner of Buildings to inspect all plans and specifications submitted in connection with the erection or construction or the alteration or repair of any billboard or signboard and to approve same if the method of construction and provisions made for fastening, securing, anchoring and maintaining such billboard or signboards are such as will serve to protect the public and to render such billboards safe and substantial. It is further made the duty of the Commissioner of Buildings to

exercise supervision over all billboards and signboards erected or being maintained under the provisions of this article; and to cause inspection by inspectors in his department of all such billboards and signboards to be made once each year and oftener where the condition of such boards so require; and whenever it shall appear to said Commissioner that any such billboard or signboard has been erected in violation of this ordinance or is in an unsafe condition or has become unstable or insecure or is in such a condition as to be a menace to the safety or health of the public, he shall thereupon issue or cause to be issued a notice in writing to the owner of such billboard or signboard or person in charge, possession or control thereof, if the whereabouts of such person is known, informing such person, firm or corporation of the violation of this ordinance and the dangerous condition of such billboard or signboard and directing him to make such alterations or repairs thereto, or to do such acts or things, as are necessary or advisable to place such billboard or signboard in a safe, substantial and secure condition and to make the same comply with the requirements of this ordinance within such reasonable time as may be stated in said notice. If the owner or person in charge, possession or control of any billboard or signboard when so notified shall refuse, fail, or neglect to comply with and conform to the requirements of such notice, said Commissioner shall, upon the expiration of the time therein mentioned, alter, change, tear down or cause to be torn down such part of such billboard or signboard as is constructed and maintained in violation of this ordinance, and shall charge the expense to the owner or person in possession, charge or control of such billboard or signboard which shall be recovered from them by appropriate legal proceedings. If the owner of such billboard or signboard or the person in charge, possession or control thereof cannot be found, or his or their whereabouts cannot be ascertained, the Commissioner shall attach or cause to be attached to said billboard or signboard, a notice of the same import as that required to be sent to the owner or person in charge, possession or control thereof, where the owner is known; and if such billboard or signboard shall not have been made to conform to this ordinance and be placed in a secure, safe and substantial condition, in accordance with the requirements of such notice, within thirty days after such notice shall have been attached to such billboard or signboard, it shall be the duty of the Commissioner of Buildings to thereupon cause such billboard or signboard or such portion thereof as is constructed and maintained in violation of this ordinance to be torn down; provided that nothing herein contained shall prevent the Commissioner of Buildings from adopting such precautionary measure as may be necessary or advisable in case of imminent danger in order to place such billboard or signboard in a safe condition, the expense of which shall be charged to and recovered from the owner of such billboard or signboard or person in charge, possession or control thereof in any appropriate proceedings therefor. No permit shall be issued to any applicant for permission to erect a billboard or signboard unless such applicant shall agree to place and maintain on the top of such billboard or signboard the name of the person or corporation owning same or who is in charge, possession or control thereof. It shall be the duty of the Commissioner of Buildings to require that the name of the person or corporation owning or in possession, charge or control of such billboard or signboard is placed upon such billboard or signboard forthwith upon the erection thereof and is kept thereon at all times such billboard or signboard is maintained; and in case the owner of such billboard or signboard or the person in charge, possession or control thereof shall fail or refuse to place and maintain such name on the same, they shall be subject to the penalty hereinafter provided for. Every person, firm or corporation engaged in the business of erecting billboards or signboards for the purpose of display advertising shall file with the Commissioner of Buildings within ninety days after the passage of this ordinance a full and complete report of the location and size of all existing billboards or signboards.

706. **Fees for Permits and Annual Inspection—Indemnifying Bond.)** (a) The fee to be charged for permits issued for the erection or construction of billboards or signboards or for the alteration thereof shall be two ($2.00) dollars for each twenty-five lineal feet of billboard or signboard erected or altered. An annual fee shall be charged every person, firm or corporation as owner, or in possession, charge or control of any billboard or signboard for inspection of such billboards or signboards, which shall be thirty-five (35) cents for each twenty-five lineal feet of billboard or signboard, or fractional part thereof.

(b) Every person, firm or corporation engaged in the business of constructing and erecting billboards or signboards shall file with the City Clerk a penal bond, with sureties to be approved by the Commissioner of Buildings, in the sum of twenty-five thousand ($25,000.00) dollars, conditioned that such person, firm or corporation shall faithfully comply with all the provisions and requirements of this ordinance with respect to the construction, alteration, location and safety of billboards or signboards and for the payment of the inspection fee required by said ordinance; and conditioned, further, to indemnify, save and keep harmless said City of Chicago and its officials from any and all claims, damages, liabilities, losses, actions, suits or judgments which may be presented, sustained, brought or secured against the City of Chicago or any of its officials on account of the construction, maintenance, alteration or removal of any of said billboards or signboards, or by reason of any accidents caused by or resulting therefrom.

707. **Frontage Consents Required.)** It shall be unlawful for any person, firm or corporation to erect or construct any billboard or signboard in any block on any public street in which one-half of the buildings on both sides of the street are used exclusively for residence purposes without first obtaining the consent in writing of the owners or duly authorized agents of said owners owning a majority of the frontage of the property on both sides of the street in the block in which such billboard or signboard is to be erected, constructed or located. Such written consents shall be filed with the Commissioner of Buildings before a permit shall be issued for the erection, construction or location of such billboard or signboard.

708. **Penalty.)** Any person, firm or corporation owning, operating, maintaining or in charge, possession or control of any billboard or signboard within the city, who shall neglect or refuse to comply with the provisions of this article, or who erects, constructs or maintains any billboard or signboard, that does not comply with the provisions of this article shall be fined not less than twenty-five ($25.00) dollars nor more than two hundred ($200.00) dollars for each offense; and each day on which any such person shall permit or allow any billboard or signboard owned, operated, maintained or controlled by him to be erected, constructed or maintained in violation of any

the provisions of this article shall constitute a separate and distinct offense.

709. **Fences—Height of.)** No wooden ence shall be constructed of greater eight than eight feet above the sidewalk rade or eight feet above the surface of the round where no grade is established.

710. **Illuminated and Other Roof Signs f Steel Skeleton Construction—Definition—eneral Requirements—Fees.)** (a) Illumiated and other roof signs regulated by this ection shall be defined as signs constructed, rected and maintained upon or over the oof of any building, which have all or any art of its letters of which said signs may e constructed either in an outline of inandescent lamps or which have painted, lush or raised letters where the face of the sign presents a surface to be affected by wind pressure not in excess of the requirements hereinafter contained; or signs having a border of incandescent lights attached thereto and reflecting light thereon; or transparent glass signs where they are lighted by electricity or other illuminant. Every such sign as hereinabove described shall be constructed with steel skeleton construction so as to present a surface to be affected by wind pressure which shall not exceed fifty per cent. of the face of the sign. No illuminated roof sign shall be erected or maintained upon or over the roof of any building unless the framework thereof shall be entirely of metal or some other equally incombustible material, and no material, except such material as is used for insulating wires and conductors, which is less combustible than metal, shall be used in, on or about, or comprise a part of any illuminated roof sign, except that the material to which the framework of any such sign shall be anchored, may be substantial beams anchored or securely fastened to the roof or walls of the buildings upon or over which any such sign is erected.

(b) The distance between the roof of said building or structure and the lower edge of such sign shall not be less than five (5) feet. The height of any such sign from the roof of the building or structure to which the same is anchored or attached shall not exceed sixty (60) feet. No such sign, hereafter erected, shall be constructed closer than six (6) feet from the edge of the roof of the building or structure upon which same is erected. No such illuminated roof sign shall be constructed on any building or structure which is over eight stories in height. Any illuminated roof sign, less than twelve (12) feet in height, shall be exempt from the provisions of this section and shall be held to be governed by the ordinances of the City of Chicago relating to billboards and signboards. No illuminated roof sign, such as is described in this section, shall be constructed, erected, maintained or put in place until the person, firm or corporation desiring to construct, erect, maintain or put in place such sign shall have made application in writing to the Commissioner of Buildings for permission so to do, submitting with such application plans and specifications showing the size, nature and construction of the sign proposed to be erected, and shall present to the City Electrician plans showing the insulation, location and construction of the electrical part of such sign. If the Commissioner of Buildings shall be of the opinion that such sign, if erected, constructed and maintained in accordance with the plans and specifications so submitted, shall be safe and secure, he shall approve the application so submitted, providing the plans bear the approval of the City Electrician, and the Commissioner of Buildings shall note his approval upon such plans and specifications and keep a copy thereof at all times on file in his office. All signs shall be constructed, erected and maintained of sufficient strength to withstand a wind pressure of not less than thirty pounds per square foot of surface without stressing the material beyond the safe limits of stress given elsewhere in this chapter. It shall be the duty of the Commissioner of Buildings to cause his building inspector or inspectors to make an inspection annually of each illuminated roof sign erected or constructed or being maintained under the provisions of this ordinance for the purpose of ascertaining whether such sign is safely and securely constructed and so anchored and fastened to the building or structure; provided, however, that the provisions of this section shall not apply to the erection, construction and maintenance of signboards and billboards as regulated by the ordinances of the City of Chicago.

(c) Any person, firm or corporation desiring to erect or maintain an illuminated roof sign, as described in this ordinance, shall pay to the city, to cover the cost of the inspection and approval by the Commissioner of Buildings of the plans and specifications of such sign, when erected, a fee of fifty dollars ($50.00) for the first five hundred (500) square feet of superficial area of such sign or fractional part thereof, and for each additional square foot two cents (2c). For each annual inspection by the Commissioner of Buildings subsequent to the first inspection there shall be paid a fee of fifty dollars ($50.00) for each illuminated roof sign. In addition to the fees herein required to be paid for inspection by the Commissioner of Buildings, there shall be paid by the owner or person having charge or control of any illuminated roof sign, as herein described, an annual inspection fee to cover the cost of such inspection which shall be made by the City Electrician, and such fee shall be at the rate provided by the ordinances of Chicago.

(d) Every illuminated roof sign erected, constructed or maintained under the provisions of this ordinance shall have the name of the owner thereof placed thereon in a legible and conspicuous manner. No person, firm or corporation shall be permitted to erect or maintain an illuminated roof sign unless he shall execute and file with the City Clerk of Chicago, with sureties to be approved by the Commissioner of Buildings, a bond to the City of Chicago in the penal sum of fifteen thousand dollars ($15,000.00), conditioned to indemnify, save and keep harmless the City of Chicago, and its officers and agents, from any damage which it, the said city, or any of said officers, may suffer, or from any costs, liability or expense of any kind whatsoever which it, the said city, or any of its officers, may be put to or which may be recovered against the said city, or any of its officers, from or by reason of the construction, erection and maintenance of such sign, and conditional further to faithfully observe and perform all the provisions and conditions of this ordinance and of any ordinance now in force or which may hereafter be passed by the City Council of the City of Chicago, relating to or governing the erection, maintenance, use or inspection of illuminated roof signs.

(e) The permission and authority granted by this ordinance shall cease at any time hereafter at the discretion of the Mayor. In case of the termination of the privileges herein granted by the exercise of the Mayor's discretion as aforesaid, all such electrical signs erected by virtue of the authority conferred by this ordinance, shall be removed at the expense of the owner or owners of the building or the person, firm, corporation or individual who are then maintaining same without any cost or expense of any kind whatsoever to the City of Chicago, provided that in the event of the failure, neglect or refusal on the part of the owner of the building or structure upon

which said illuminated electric sign is constructed or the person, firm, corporation or individual operating and maintaining said electric sign to remove said electric sign upon the revocation of the permit by the Mayor as herein provided, the Commissioner of Buildings may proceed to remove same and charge the expense thereof to the owner of the building or structure upon which said illuminated electric sign is constructed or the person, firm, corporation or individual operating or maintaining same.

(f) Any person, firm or corporation who shall erect, construct or maintain an illuminated roof sign in violation of any of the provisions of this section shall be fined not less than fifty dollars ($50.00) nor more than two hundred dollars ($200.00) for each offense.

ARTICLE XXIV.

Frontage Consents.

711. **Definition of Word "Block" as Used in This Chapter.)** Whenever a provision is made in this chapter that frontage consents shall be obtained for the erection, construction, alteration, enlargement or maintenance of any building or structure in any block, the word "block," so used, shall not be held to mean a square, but shall be held to embrace only that part of a street bounding the square which lies between the two nearest intersecting streets, one on either side of the point at which such building or structure is to be erected, constructed, altered, enlarged or maintained, unless it shall be otherwise specifically provided.

712. **Frontage Consents—For What Required.)** It shall be unlawful for any person, firm or corporation to locate, build, construct, or maintain on any lot fronting on any street or alley in the city in any block in which one-half of the buildings on both sides of the street are used exclusively for residence purposes, or within fifty feet of any such street, any building or place used for gas reservoir, packing house, rendering plant, soap factory, tannery, blacksmith shop, foundry, or machine shop or factory combined with a foundry, or laundry to be run by machinery, or livery stable, without the written consent of a majority of the property owners according to frontage on such street or alley. Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction or alteration of any building or place for any of the above purposes; provided, that in determining whether one-half of the buildings on both sides of the street are used exclusively for residence purposes any building fronting upon another street and located upon a corner lot shall not be considered.

712a. **Frontage Consents—For What Required.)** It shall be unlawful for any person, firm or corporation to locate, build or construct any store for the sale at retail of goods, wares and merchandise, on any street in any block in which all the buildings are used exclusively for residence purposes, without first securing and filing with the Commissioner of Buildings the written consent of a majority of the property owners according to frontage on both sides of the street in the block in which the building to be thus used is located; provided, in determining whether all the buildings in the said block are used exclusively for residence purposes, any building fronting upon another street and located upon a corner lot shall not be considered.

713. **Reformatories—Sheltering Institutions.)** (a) It shall be unlawful for any person, firm or corporation to build, construct, maintain, conduct or manage any reformatory, rescue or sheltering institution in any block or square in which one-half of the buildings on both sides of the street or streets on which the proposed reformatory, rescue or sheltering institution may front, are used exclusively for residence purposes without the written consent of a majority of the property owners, according to frontage on both sides of the streets bounding such block. Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction, alteration, or maintenance of such building.

(b) Provided, that in determining whether one-half of the buildings on both sides of the street are used exclusively for residence purposes, any building fronting upon another street and located upon a corner lot shall not be considered.

714. **Permit for Moving Frame Buildings —Requirements—Written Consents Must Be Obtained—Affidavits Made—Space Occupied on Lot.)** (a) Permits to move frame buildings shall be granted if any such frame building has not been damaged to an extent greater than fifty per cent. of its value by fire, decay, or otherwise. Any person desiring to remove a frame building shall first obtain the written consent to such removal from persons owning a majority of the frontage of the lots on both sides of the street in the same block to which the building is to be removed.

(b) Provided, however, that no permit shall be issued for the removal of any frame building from any point outside the fire limits to any point within the fire limits when such building is of such a character that it would not be lawful to build it within the fire limits when such building is of a character that it would not be lawful to build it within the fire limits, nor for the removal of any frame building from any point within the fire limits to any other point within the fire limits, unless the person, firm or corporation desiring to remove the same shall first obtain the written consent for such removal from the persons owning two-thirds of the frontage of the lots on both sides of the street in the block to which the building is to be moved. The space to be occupied on any lot used for residence or tenement house purposes shall comply with the provisions of Section 440 of this chapter.

(c) No frontage consent shall be required of any person, firm or corporation for removing a building upon his own premises and not going upon the premises of any other person, or upon any street, alley or other public place, in making such removal.

715. **Amusements—Frontage Consents Required.)** It shall be unlawful for any person, firm or corporation to construct or erect any building designed or intended to be used for the purpose of presenting or carrying on therein any entertainment for which a license is required by the ordinances of the City of Chicago without first obtaining the written consent of the property owners as required by the City ordinances.

716. **Garages—Frontage Consents Required.)** It shall be unlawful for any person, firm or corporation to locate, build, construct or maintain any garage within two hundred feet of any building used as and for a hospital, church, or public or parochial school, or the grounds thereof, and it shall be unlawful for any person, firm or corporation to locate, build, construct or maintain any garage in the city in any block in which two-thirds of the buildings on both sides of the street are used exclusively for residence purposes, or within one hundred feet of any such street in any such block, without securing the written consent of the majority of the property owners according to frontage on both sides of the street, as required by the ordinances of Chicago.

717. **Storage of Shavings and Sawdust in Buildings Used for Residence Purposes.)** No person, firm or corporation shall keep, pile, store or accumulate loose shavings, excelsior, sawdust or other similar inflammable materials in any quantity, nor shall any such materials in bales be stored in any quantity exceeding 2,000 pounds in any building used wholly or in part for residence purposes.

ARTICLE XXV.

Fire Limits.

718. **Fire Limits—Provisional Fire Limits.)** (a) The fire limits of the City of Chicago shall be and they are hereby defined as follows: All that part of the City of Chicago bounded by the following limits: Commencing at the intersection of the shore of Lake Michigan and the center line of Devon avenue, thence west along the center line of Devon avenue to the west line of the present right-of-way of the Evanston Division of the Chicago, Milwaukee and St. Paul Railway Company, thence south along said west line of said right-of-way to the center line of Lawrence avenue, thence west along said center line of Lawrence avenue to the center line of North Clark street, thence southeasterly along the center line of said North Clark street to the center line of Sheffield avenue, thence south along the center line of Sheffield avenue to the center line of Fullerton avenue, thence west along the said center line of Fullerton avenue to the center line of the North Branch of the Chicago River, thence northwesterly along the center of said North Branch of the Chicago River to the center line of Belmont avenue, thence west along said center line of Belmont avenue to the center line of Kedzie avenue, thence south along said center line of Kedzie avenue to the center line of West North avenue, thence west along the center line of West North avenue to the center line of North 46th avenue, extended, thence south along the center line of North 46th avenue, extended, to the center line of West Division street, thence east along the center line of West Division street to the center line of North 40th avenue, thence south along the center line of North 40th avenue to the first alley north of Park avenue, thence west along the center line of said alley to the center line of North 46th avenue, thence south along the center line of North 46th avenue to the center line of West Madison street, thence west along the center line of West Madison street to the center line of North 48th avenue, thence north along said center line of North 48th avenue to center line of Kinzie street, thence west along said center line of Kinzie street to the center line of North 52d avenue, thence south along said center line of North 52d avenue to the center line of West Madison street, thence east along said center line of West Madison street to the center line of South 50th avenue, thence south along said center line of South 50th avenue, to the north line of the present right-of-way of the Chicago and Great Western Railroad Company, thence east along the said north line of said right-of-way to the center line of South 48th avenue, thence south along the said center line of South 48th avenue to the center line of West 12th street, thence east along said center line of West 12th street to the center line of South 46th avenue, thence south along the said center line of South 46th avenue to the center line of West 22d street, thence east along said center line of West 22d street to the center line of South 40th avenue, thence south along said center line of South 40th avenue to the center line of the Illinois and Michigan canal, thence northeasterly along the center line of said canal to the center line of South Western avenue, thence south along said center line of South Western avenue to the center line of West 39th street, thence east along said center line of West 39th street to the center line of State street, thence south along said center line of State street to the north line of West 47th street, thence west along said north line of West 47th street to a line seventy-five feet west of the west line of South Halsted street, thence south along said line seventy-five feet west of the west line of South Halsted street to a line seventy-five feet north of the north line of West 63d street, thence west along said line seventy-five feet north of the north line of West 63d street to the center line of South Ashland avenue, thence south along the center line of South Ashland avenue to the center line of West 63d street, thence east along said center line of West 63d street to the center line of State street, thence south along said center line of State street to the center line of East 75th street, thence east along said center line of East 75th street to the center line of Railroad avenue, thence south along the center line of Railroad avenue to the center line of 79th street, thence east along the center line of East 79th street to the shore of Lake Michigan, thence northerly and northwesterly along the shore of Lake Michigan to the place of beginning.

(b) Also, commencing at a point in the center of Manistee avenue where it intersects the right-of-way of the main line of the Lake Shore and Michigan Southern Railroad, thence northeasterly and north along the center line of Manistee avenue to the center line of 89th street, thence east along the center line of 89th street to the center line of Mackinaw avenue, thence south along the center line of Mackinaw avenue to the center line of Harbor avenue, thence southwesterly along the center line of Harbor avenue to the center line of East 93d street, thence west along the center line of East 93d street to the easterly line of the Baltimore and Ohio Railroad right-of-way, thence south along the easterly line of the Baltimore and Ohio Railroad right-of-way and Baltimore and Ohio Railroad extended to the northeasterly line of said Lake Shore and Michigan Southern Railroad, thence northwesterly along the northeasterly line of said right-of-way to the place of beginning.

(d) Excepting, however, the territory bounded as follows:

Commencing at the intersection of a line seventy-five feet west of the west line of South State street and a line seventy-five feet south of the south line of West 47th street, thence west along said line seventy-five feet south of the south line of West 47th street, to a line seventy-five feet east of the east line of Wentworth avenue; thence south along said line seventy-five feet east of the east line of Wentworth avenue to a line seventy-five feet east of the east line of Wentworth avenue to a line seventy-five feet north of the north line of West 63d street to a line seventy-five feet west of the west line of South State street; thence north along said line seventy-five feet west of the west line of South State street to the place of beginning.

(e) Also, that territory within the lines beginning at the intersection of a line seventy-five feet west of the west line of Wentworth avenue, and a line seventy-five feet south of the south line of West 47th street; thence west along said line seventy-five feet south of the south line of West 47th street to a line seventy-five feet east of the east line of South Halsted street; thence south along said line seventy-five feet east of the east line of South Halsted street to a line seventy-five feet north of the north line of West 63rd street, thence east along said line seventy-five feet north of the north line of West 63d street to a line seventy-five feet west of the west line of Wentworth

avenue; thence north along said line seventy-five feet west of the west line of Wentworth avenue to the place of beginning.

(f) And, also excepting the following territory, which shall be known as a provisional fire limit; commencing at the intersection of the shore of Lake Michigan and the center line of East 79th street, thence west along the center line of East 79th street to the center line of Railroad avenue, thence north along the center line of Railroad avenue to the center line of East 75th street, thence west along the center line of East 75th street to the center line of South State street, thence north along the center line of South State street to the center line of East 63rd street, thence east along the center line of East 63rd street to the center line of Cottage Grove avenue, thence south along the center line of Cottage Grove avenue to the center line of East 67th street, thence east along the center line of East 67th street to the shore of Lake Michigan, thence southerly and southeasterly along the shore of Lake Michigan to the place of beginning.

(g) Any person desiring to erect a frame or wooden building to be used for residence or mercantile purposes within the territory last above described shall have a right to do so, upon presenting a petition to the Commissioner of Buildings together with a plat, plans and specifications showing the place where such building is to be erected. Such petition shall be verified by the affidavit of the applicant and shall contain the written consent of the owners of a majority of the frontage upon both sides of the street surrounding the square in which the building is to be erected.

(h) No frame or wooden residence or mercantile building shall be erected within the said provisional fire limits exceeding forty feet high, unless the basement story shall be constructed five feet above the sidewalk.

719. **Nuisance.)** (a) Every building or structure constructed or maintained in violation of this chapter, or which is in an unsanitary condition, or in an unsafe or dangerous condition or which in any manner endangers the health or safety of any person or persons, is hereby declared to be a public nuisance.

(b) Every building or part thereof which is in an unsanitary condition by reason of the basement or cellar being damp or wet, or by reason of the floor of such basement or cellar being covered with stagnant water, or by reason of the presence of sewer gas, or by reason of any portion of a building being infected with disease or being unfit for human habitation or which by reason of any other unsanitary condition, is a source of sickness, or which endangers the public health, is hereby declared to be a public nuisanse.

720. **Penalty.)** Any person, or corporation who violates, neglects or refuses to comply with, or who resists or opposes the enforcement of any of the provisions of this chapter, shall be fined not less than twenty-five nor more than two hundred dollars for each offense, and every such person or corporation shall be deemed guilty of a separate offense for every day on which such violation, neglect or refusal shall continue; and any builder or contractor who shall construct any building in violation of any of the provisions of this chapter, and any architect designing, drawing plans for or having charge of such building or who shall permit it to be constructed, shall be liable to the penalties provided and imposed by this section.

721. (a) All ordinances or parts of ordinances inconsistent herewith or repugnant hereto are hereby repealed.

(b) An ordinance passed March 20, 1905, relative to buildings, designated as Chapter XV and known as Sections 199 to 738, both inclusive, of the Revised Municipal Code of Chicago of 1905, and all amendments thereto, are hereby repealed, but this ordinance shall not be construed or held to repeal any former ordinance as to any offense committed against the former ordinance, or as to any act done, any penalty, forfeiture or punishment incurred, or any right accrued, or claims arising under the former ordinance, or in any way whatever to affect any such offense or act so committed or done, or any penalty, forfeiture or punishment so incurred, or any right accrued or claims arising before this ordinance takes effect, save only that the proceedings hereafter shall conform so far as practicable to the ordinances in force at the time of such proceeding. If any penalty, forfeiture or punishment be mitigated by any provision of this ordinance such provision may, by the consent of the party affected, be applied to any judgment pronounced after the new ordinance takes effect.

ARTICLE XXVI.

Wood Lathing and Plastering.

722. In all buildings of ordinary construction where the use of wood lath and plaster is permitted under the provisions of this Code, such wood lath and plaster shall be done in accordance with these specifications:

Wood Lath. Wood lath shall not be over 1½ inches wide and shall be nailed to each stud, joist or bearing with not less than a three-penny fine 16-gauge nail. Lath to have joints broken with not over seven lath to a break. Lath to be spaced not less than ¼-inch apart. All wood lath must be covered with at least two coats of plaster, such lath and plaster to finish to a total thickness of at least ⅞ of an inch. No dirt or loamy sand to be used in the mortar or plaster.

Section 2. This ordinance shall be in full force and effect from and after its passage, approval and due publication.

HEIGHT OF BUILDINGS.

Be it ordained by the City Council of the City of Chicago:

Section 1. **Buildings—Height of.)** No building shall hereafter be erected of greater height than two hundred sixty feet from the sidewalk level to the highest point of external bearing walls. The erection of parapet walls or of ballustrades constructed entirely of incombustible material shall be permitted above the roof level of buildings of all classes and in addition to the height herein fixed for the same.

Section 2. This ordinance shall be in full force and effect from and after its passage, approval and due publication.

Passed Dec. 19th, 1910.

Be it ordained by the City Council of the City of Chicago:

Section 1. **No Amusement License to Issue Without Certificate from City Officials.)** No license shall be issued to any person, firm or corporation to produce, present, conduct, operate or offer for gain or profit, any theatricals, shows or amusements until the Commissioner of Buildings, the Commissioner of Health, the Fire Marshal and the City Electrician shall have certified in writing that the room or place where it is proposed to produce, present, conduct, operate or offer such theatricals, shows or amusements complies in every respect with the ordinances of the City of Chicago.

Section 2. **Lighting—Buildings Kept Lighted During Performance.)** Every portion of any building or structure in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain or profit devoted to the use or accommodation of the public, and all outlets therefrom leading to the street, including all open courts, corridors, stairways, exits and emergency exit stairways shall be well and properly lighted during every performance, and shall remain lighted until the entire audience has left the premises. It shall be the duty of the Fire Marshal to enforce the provisions of this section.

Section 3. **Independent Lighting Systems for Exits.)** All stairways and corridors in every building or structure in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, shall be supplied with a supplemental lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building or structure and shall be in operation during the entire period that such building or structure is open to the public and until the entire audience has left the building.

The word "Exit" shall appear in letters at least six inches high over the opening of every means of egress from such building or structure, and a red light shall be kept burning over such sign.

It shall be the duty of the City Electrician to enforce the provisions of this section relative to the installation of the lighting provisions contained therein; and it shall be the duty of the Fire Marshal to see the lights are kept lighted as required by this section.

Section 4. **Gas Calcium Lights Prohibited—Arc Lights.)** The use of gas calcium lights in any building in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, is hereby prohibited.

All arc lights used on the stage shall be subject to the approval of the City Electrician.

Section. 5. **Exit Doors or Gates Not to be Locked—Obstructions Prohibited.)** No exit door or gate in any place in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, shall be locked or fastened in any manner during the entire time that such place of amusement is open to the public.

All aisles, passageways, corridors and exits of all such places of amusement shall be kept free from camp stools, chairs, sofas, draperies and other obstructions, and no person shall be allowed to stand in or occupy any of such aisles, passageways, corridors or exits during any performance.

Section 6. **Diagram of Exits and Seats.)** It shall be the duty of the owner, lessee or manager of any theater having a seating capacity in excess of 300 persons, to cause to be printed on all programs furnished for any performance, on the page opposite to that upon which the cast is printed, a diagram showing conspicuously the place of every exit from such building. A diagram of the floor plan showing the location of every seat on each floor, and also the exits leading from each floor, drawn to a scale of one-eighth of an inch to the foot, shall be posted in a conspicuous place in the box office of any such theater, so as to be easily seen by the public. It shall be the duty of the Fire Marshal to enforce the provisions of this section.

Section 7. Any person, firm or corporation violating any of the provisions of this ordinance shall be fined not more than two hundred dollars for each offense, and each and every day upon which any such person, firm or corporation shall give, conduct, produce, present, offer or operate any such entertainment contrary to or in violation of any of the provisions of this ordinance shall constitute a separate and distinct offense.

Section 8. This ordinance shall be in full force and effect from and after its passage, approval and due publication.

Passed Dec. 5th, 1910.

AN ORDINANCE

Concerning special stage firemen and fire guards in theatres having a seating capacity for three hundred or more persons.

Be it ordained by the City Council of the City of Chicago:

Section 1. **Special Stage Firemen and Fireguards Required.)** It shall be the duty of every person, firm or corporation conducting, operating or maintaining any room in a building which is used regularly for theatrical or vaudeville purposes and where an admission fee is charged and having a seating capacity for three hundred or more persons, to procure and keep at his, their or its own expense one adult male person as a special stage fireman and one adult male person as a fireguard who shall wear such uniform and badge as the Fire Marshal of the City of Chicago may prescribe. Such special stage fireman shall be responsible to and under the direction and subject to the control of said Fire Marshal or his accredited representative during such time as any such theatre may be open to the public. Such special stage fireman shall be kept on duty by every such person, firm or corporation at every such building conducted by him, them or it as aforesaid at least thirty minutes prior to the commencement of any performance, during the entire time of such performance and until the entire audience shall have left the building.

Section 2. **Duties of Special Stage Fireman.)** It shall be the duty of such special stage fireman to see that all fire appliances on the stage and above and below, it, in the dressing rooms and throughout the basement of any such building used as a theatre, are in their proper places and in good working order; that the tanks supplying the standpipes and the sprinkling system are full of water, that the ventilator above the stage and other ventilation apparatus used in connection with the theatre are in operation and in good working order and changing the air, as required by the ordinances of the city. Such special stage fireman shall make daily reports, in duplicate, in such manner and form as said Fire Marshal shall prescribe, which report shall be counter-

signed by the fireguard. The original of the aforesaid report shall be delivered to the Fire Marshal of the City of Chicago and the duplicate thereof shall be delivered to the owner of the theatre, where such special stage fireman is employed, or to the person having the management thereof. Said special stage fireman shall be subject to the orders of the Fire Marshal during such time as the theatre shall be open and occupied by the public.

Section 3. **Fireguard—Duties.)** It shall be the duty of such fireguard to see that all exit doors are unfastened and unobstructed, that the aisles are kept clear and free from all obstructions and that all the provisons of the ordinances of the City of Chicago relating to theatres are observed and complied with. Such fireguard may, in the discretion of the owner or manager of the theatre wherein he is employed, act as chief usher or auditorium superintendent during performances.

Section 4. **Monthly Report to Fire Marshal.)** It shall be the duty of such special stage fireman and fireguard to report in person to the Fire Marshal or his accredited representative, at least once in each month, and they and each of them shall be subject to, and required to obey such rules and regulations as the Fire Marshal shall prescribe governing the duties to be performed by them in conformity with this ordinance; provided, however, that such rules and regulations shall apply to all special stage firemen and fireguards.

Section 5. **Interpretation.)** This ordinance shall not be so construed as to prevent the owners or managers of theatres employing special stage firemen or fireguards from assigning such persons so employed to duties other than those enumerated in this ordinance when the theatre is not open to the public.

Section 6. **Duties of Fire Marshal—License—Revocation.)** Said Fire Marshal shall cause all such theatres to be inspected daily by a proper officer of the Fire Department, and he shall also examine all persons who desire to seek employment as special stage firemen or fireguards, as to their qualifications and fitness for the duties for which they seek to be employed, and whenever said Fire Marshal finds any such applicant to be competent, he shall, without charge, issue a license to such applicant and he may revoke any such license issued by him at any time, when in his judgment such special stage fireman or fireguard is incompetent, inefficient or has neglected to perform the duties required of him in this ordinance; provided, however, that said Fire Marshal shall not revoke any license without giving to the person to whom such license was issued a reasonable opportunity to be heard on the subject of such revocation.

It shall be unlawful for any person, firm or corporation to employ a person either as special stage fireman or as a fireguard unless such person is licensed as provided in this ordinance.

Section 7. **Fire Apparatus.)** In every building or place having a seating capacity of less than 300, in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, there shall be provided and kept upon the stage, two hand water pumps, two fire axes, two pike poles, and also one hand water pump in the basement or other portion of the building or place used as a dressing room or rooms; also one hand water pump and one fire axe in the auditorium thereof.

In every building or place having a seating capacity in excess of three hundred persons in which theatricals, shows and amusements are offered, operated, presented or exhibited for gain, there shall be kept two or more portable fire extinguishers on the stage and two or more portable fire extinguishers under the stage, which shall at all times be kept filled with water; also four fire axes, two 15-foot pike poles and two 10-foot pike poles on each tier or floor of the stage.

Section 8. **Fire Apparatus to be Under Control of Fire Department.)** All standpipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtains, switch boxes, ventilators, controlling levers, axes, pike poles and all apparatus for the extinguishing of fire or guarding against fire shall be kept at all times in a condition satisfactory to and under the control of the Fire Marshal.

Section 9. **Penalty.)** Any person, firm or corporation who violates, neglects or refuses to comply with the provisions of this ordinance shall be fined not less than twenty-five ($25.00) dollars nor more than two hundred ($200.00) dollars for each offense, and every such person, firm or corporation shall be deemed guilty of a separate offense for every day that such violation, neglect or refusal shall continue and any proprietor of a theatre who shall have violated any of the provisions of the foregoing sections, shall in the discretion of the Mayor on recommendation by said Fire Marshal, have his, their or its license to conduct, operate or maintain such theatre revoked.

Section 10. This ordinance shall be in full force and effect from and after its passage, approval and due publicaton.

Passed Dec. 5th, 1910.

BUILDING ORDINANCES

OF THE CITY OF CHICAGO

As contained in Chapter XV of the revised Municipal Code of Chicago (passed March 20, 1905, published April 15, 1905), together with all amendments up to and including July 18, 1910.

All amendments and additions will be found printed in italics under proper Section numbers, except the Fire Limits Ord. (Sec. 686) and Ord. covering Bill and Sign Boards and Fences (Sec. 705 to 715).

***NOTICE*—This ordinance is still in full force and will continue to be so until the new ordinance now under consideration is passed, at which time same will be sent to subscribers of this publication as a supplement.**

CHAPTER FIFTEEN

ARTICLE I.

OFFICERS—POWERS AND DUTIES.

Section 199. **(Department of Buildings Established.—Officers.)**—There is hereby established an executive department of the municipal government of the city, which shall be known as the Department of Buildings, and shall embrace a Commissioner of Buildings, a Deputy Commissioner of Buildings, an Assistant Deputy Commissioner of Buildings, a Civil Engineer, a Secretary to the Commissioner, a Chief Building Inspector, and such Inspectors of Elevators, Inspectors of Stand Pipes and Fire Escapes, and Inspectors of Buildings, and such other assistants and employes as the City Council may by ordinance provide.

Sec. 200. **(Building Commissioner.—Office Created.—Appointment.—Bond.)**—There is hereby created the office of Commissioner of Buildings. He shall be the head of said Department of Buildings, and shall be an experienced architect, civil engineer, builder, or competent building mechanic, and shall have been engaged in the city as an architect, civil engineer, builder or building mechanic for a period of ten years, and during his term of office as Commissioner of Buildings, he shall not be engaged in any other business.

He shall be appointed by the Mayor, by and with the advice and consent of the City Council.

The Commissioner of Buildings, before entering upon the duties of his office, shall execute a bond to the City in the sum of twenty-five thousand dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of his duties as the Commissioner of Buildings.

As amended by ordinance Feb. 3, 1908.

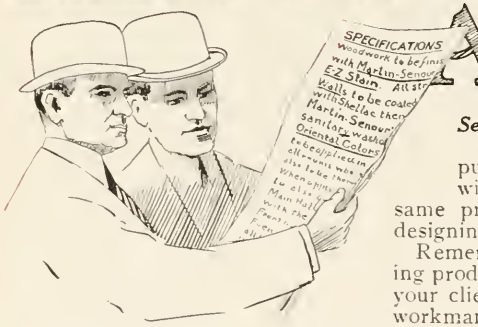
Sec. 201. **(Powers.—Appointment of Subordinates.—Bonds.—Duties of Commissioner.)**—He shall have the management and control of all matters and things pertaining to the Department of Buildings, and shall appoint, according to law, all subordinate officers and assistants in his department and may remove them according to law. All subordinate officers, assistants, clerks and employes in said Department shall be subject to such rules and regulations as shall be prescribed from time to time by said Commissioner.

It shall be the duty of said Commissioner to enforce all ordinances relating to the erection, construction, alteration, repair, removal or the safety of buildings.

Sec. 202. **(Precautions in Behalf of Public Safety.—May Require Repair or Alteration in Such Cases.)**—Amended by ordinance Feb. 3, 1908, to read as follows:

It shall be the duty of the Commissioner of Buildings, when any citizen represents that ashes or combustible materials are kept in any place in the City in an insecure manner, or that the doors, stairways, corridors, exits, or fire escapes in any factory or workshop or other place of employment are insufficient for the escape of employes in case of fire, panic, or accident, or do not comply with the provisions of this chapter or that the funnels, flues, fire boxes, or heating apparatus in any building in the City are insecure or dangerous, or that any part of any building in the City is in an unsafe or dangerous condition, or in any

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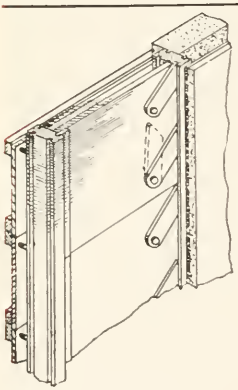
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wise in contravention of this chapter, to make an examination of such place or building, and if such representation is found to be true, said Commissioner shall give notice in writing to the owner, occupant, lessee or person in possession, charge or control of such place or building to make such changes, alterations or repairs as public safety or the ordinance of the City may require.

Upon failure of parties so notified to comply with said notice, the matter shall be placed in the Law Department for prosecution.

Sec. 203. **(Access to all Buildings for the Purpose of Investigating Complaints.—Interpretation of this Chapter.)**—Amended by ordinance Feb. 3, 1908, to read as follows:

The Commissioner of Buildings, or his representatives, shall have access to all public school buildings, public halls, churches, theaters, and all buildings used either for manufacturing or commercial purposes, also all hotels, apartment houses and other buildings occupied by large numbers of people, where any complaint is made concerning the safety of such buildings, or any parts or appliances or equipment thereof; for the purpose of investigating and determining the sufficiency of their doors, passageways, aisles, stairways, corridors, exits, or fire escapes, and generally their facilities for egress in case of fire or other accident, and the strength of their floors, and shall make return of all violations of several provisions of this chapter to the Law Department for prosecution.

The Commissioner of Buildings shall have full power to pass upon any question arising under the provisions of this chapter subject to the conditions, modifications and limitations contained therein.

Sec. 204. **(Inspection of Elevators.—Power to Stop Use of Same.)**—The Commissioner of Buildings shall have power to prohibit and stop the use of any passenger or freight elevator when any Inspector of Elevators shall report to him that such elevator or the hoistway in which it is used is in a dangerous or unsafe condition. Such prohibition of use shall continue in force until such hoistway or elevator, or both, shall have been put in a safe condition, and certified to be safe after a proper inspection thereof by the Inspector of Elevators.

Sec. 205. **(Buildings Found in Unsafe Condition.—Notice to Owner.—Authority of Commissioner.)**—If the Commissioner of Buildings shall find in the city any building or structure or part thereof in such an unsafe condition as to endanger life, but so that, by the immediate application of precautionary measures such danger may be averted, he shall have authority, and it shall be his duty to forthwith notify in writing, the owner, agent, or person in possession, charge or control of such building or structure or part thereof to adopt and put into effect such precautionary measures as may be necessary or advisable in order to place such building or structure or part thereof in a safe condition. Such notice shall state briefly the nature of the work required to be done, and said Commissioner shall specify in such notice a time within which the work required to be done shall be completed by the person notified, such time to be fixed by said Commissioner upon taking into consideration the condition of such building or structure, or part thereof, and the danger to life or property which may result from its unsafe condition.

If the owner, agent or person in possession, charge or control of such building or structure, or part thereof, when so notified, shall fail, neglect or refuse to place such building or structure, or part thereof, in a safe condition, and to adopt such precautionary measures as shall have been specified by said Commissioner within the time specified in such notice, in such case, at the expiration of such time, it shall be the duty of said Commissioner to proceed forthwith to do, or cause to be done, any and all work necessary to place such building or structure, or part thereof, in a safe condition.

If the said commissioner shall be unable to find the owner of such building, structure, or part thereof, or any agent or person in possession, charge or control thereof, upon whom such notice may be served, he shall place or cause to be placed the notice herein provided for, upon such building at or near its principal entrance, and if, at the expiration of the time specified in such notice for the completion of the work required to be done the terms of such notice shall not have been complied with, it shall be the duty of the Commissioner to thereupon proceed and do such work in the same manner as has hereinbefore been provided in cases of refusal, neglect or failure on the part of the owner, agent or person in possession, charge or control of any such building, structure or part thereof, when so notified.

If, in accordance with the provisions of this section, the work of placing any building, structure, or part thereof in a safe condition shall devolve upon the said commissioner, and it shall appear that such building, structure or part thereof is in such a condition as not to warrant the expenditure thereon of a sufficient sum of money to make such repairs or to do such work as is necessary to put it in a safe condition, the said Commissioner shall have authority to tear down or destroy such building or structure or part thereof, and the expense of tearing down and destroying any such

building or structure or part thereof, and the expense of making any repairs or doing any work thereon shall be charged to the person owning or in possession, charge or control of such building or structure or part thereof, and the Commissioner shall recover or cause to be recovered from such owner or person in possession, charge or control the cost to the city of doing such work.

Sec. 206. **(Building or Part of Building Constructed in Violation of Chapter.—Authority of Commissioner to Tear Down.)**—If it shall be found that any building or structure or part thereof is being or shall have been constructed or built in violation of any of the provisions of this chapter, the Commissioner of Buildings shall forthwith notify the owner, agent, superintendent or architect of, or the contractor engaged in erecting such building or structure, or part thereof, of the fact that such building or structure, or part thereof, has been, or is being, constructed or erected contrary to the provisions of this chapter, and shall specify briefly in such notice in what manner the provisions of this chapter, or any of them, have been violated, and shall require the person so notified to forthwith make such building, structure, or part thereof, conform to and comply with the provisions of this chapter, specifying in such notice the time within which such work shall be done.

If, at the expiration of the time set forth in such notice, the person so notified shall have refused, neglected or failed to comply with the request made in such notice and to have such building or structure, or part thereof, concerning which notice was sent, changed so as to conform to and comply with the provisions of this chapter, the Commissioner of Buildings shall have the authority, and it shall be his duty, to proceed forthwith to tear down or cause to be torn down such building or structure, or such part thereof as shall or may have been erected and constructed in violation of the provisions or any of the provisions of this chapter, and the cost of such work shall be charged to and recovered from the owner of such building or structure or from the person for whom such building or structure is being erected.

Sec. 207. **(May Direct Fire Department to Remove.)**—The Commissioner of Buildings shall also have authority to direct the Fire Department, after written notice has been served upon the owner, lessee, occupant, agent or person in possession, charge or control, personally, to tear down any defective or dangerous wall or any building or any part thereof which may be constructed in violation of the terms of this chapter. In case of the destruction, or partial destruction, of buildings by fire or by the action of the elements, when any department of the city government, pursuant to the ordinances of the city, shall make any outlay of money or incur any liability for the payment of any expense on behalf of the city in an effort to preserve or prevent the destruction of any such building or buildings, or for the preservation of the life or health of its citizens, it shall be the duty of the Commissioner of Buildings to ascertain the amount of such outlay or expenditure and present a bill therefor to the owner or owners of any such building or buildings, or his or their agent or agents, and it shall be the duty of the said Commissioner of Buildings to refuse to issue a permit for the reconstruction, alteration or repair of any such building or buildings by such owner or owners until such outlay or expenditure shall be repaid to the city by the owner or owners of such building or buildings so totally or partially destroyed in the manner aforesaid. Said Commissioner shall also proceed forthwith to collect from such owner or owners, by appropriate proceedings, the amount of such bill.

Sec. 208. **(May Make Rules for Construction of Buildings and Control of Employes.)**—The Commissioner of Buildings shall institute such measures and prescribe such rules and regulations for the control and guidance of his subordinate officers and employes as shall secure the careful inspection of all buildings while in process of construction, alteration, repair or removal and the strict enforcement of the several provisions of this chapter.

Sec. 209. **(May Stop Construction and Wrecking of Buildings.)**—Amended by ordinance Dec. 11, 1905, to read as follows:

Said Commissioner shall have power to stop the construction of any building or the making of any alterations or repairs of any building within said city when the same is being done in a reckless or careless manner or in violation of any ordinance, and to order, in writing, or by parole, any and all persons in any way or manner whatever engaged in so constructing, altering or repairing any such building, to stop and desist therefrom.

And the said Commissioner shall have power to stop the wrecking or tearing down of any building or structure within said city when the same is being done in a reckless or careless manner or in violation of any ordinance or in such a manner as to endanger life or property, and to order any and all persons engaged in said work to stop and desist therefrom. When such work has been stopped by the order of said Commissioner, it shall not be resumed until said Commissioner shall be satisfied that adequate precautions will be taken for

the protection of life and property, and that said work will be prosecuted carefully and in conformity with the ordinances of the city.

(The penalties prescribed by Section 738, for violations, shall apply with equal force and effect to violations of this section.)

Sec. 210. **(Arbitration Appeal from Decision.)**—In cases where discretionary power to estimate damage to frame buildings is given the Commissioner of Buildings, as also in questions relating to the security or insecurity of any building or buildings, or parts thereof, and in all other cases where discretionary powers are, by ordinance, given to the Commissioner of Buildings, an appeal to arbitration shall be allowed to parties believing themselves injured or wronged by the decisions of the Commissioner of Buildings, as follows, to wit:

Sec. 211. **(Appeal.—Limit of Time of.)**—Any person wishing to make such appeal shall do so within five days after written notice of the decision or order of the Commissioner of Buildings has been given him. An appeal made later than five days after the serving of the notice of the Commissioner of Buildings shall not entitle the appellant to an arbitration. The request for arbitration shall be in writing and shall state the object of the proposed arbitration and the name of the person who is to represent the appellant as arbitrator.

Sec. 212. **(Appeal.—Cost of.)**—The Commissioner of Buildings shall thereupon state to the appellant the cost of such arbitration, and such appellant shall, within twenty-four hours from the time of filing the original request for arbitration, deposit with the Commissioner of Buildings the sum of money required for defraying the expenses of the same, which sum shall in each case be fixed by said Commissioner in proportion to the difficulty and importance of the case, but shall in no case be more than the cost of similar service in the course of ordinary business of private individuals or corporations. As soon as such sum of money shall have been deposited with him the Commissioner of Buildings shall appoint an arbitrator to represent the city, and the two arbitrators thus appointed shall, if they cannot agree, select a third arbitrator, and the decision of any two of these arbitrators shall, after investigation of the matter in question, be final and binding on the appellant as well as upon the city.

Sec. 213. **(Arbitrators to Take Oath.—Power to Examine Witnesses.)**—The arbitrators shall themselves, before entering upon the discharge of their duties, be placed under oath to the effect that they are unprejudiced as to the matter in question and that they will faithfully discharge the duties of their position. They shall have the power to call witnesses and place them under oath, and their decision or award shall be rendered in writing both to the Commissioner of Buildings and to the appellant from his decision. The fee deposited by the appellant with the Commissioner of Buildings shall be paid by the Commissioner of Buildings to the arbitrators upon the rendering of their report, and shall be in full of all costs incident to the arbitration; but should the decision of said board of arbitration be rendered against the Commissioner of Buildings, then the money deposited by the aforesaid appellant shall be returned to him, and the entire cost of such arbitration shall be paid by the city.

Sec. 214. **(In Urgent Cases.—Commissioner's Power Final.)**—Whenever the decision of the Commissioner of Buildings upon the safety of any building or any part thereof is made in a case so urgent that failure to properly carry out his orders to demolish or strengthen such building or part thereof may endanger life and limb, the decision and order of the Commissioner of Buildings shall be absolute and final.

Sec. 215. **(Duty of Police to Assist Commissioner in Enforcing Provisions of This Chapter.)**—Whenever it shall be necessary, in the opinion of the Commissioner of Buildings, to call upon the Department of Police for aid or assistance in carrying out or enforcing any of the provisions of this chapter, he shall have the authority so to do, and it shall be the duty of the Department of Police, or of any member of said Department, when called upon by said Commissioner, to act according to the instructions of, and to perform such duties as may be required by, said Commissioner in order to enforce or put into effect the provisions of this chapter.

Sec. 216. **(Certificates.—Notices.—Register.)**—The Commissioner of Buildings shall sign or cause to be signed all certificates and notices required to be issued from said Department, and keep a record of the same, and issue or cause to be issued all permits authorized herein. He shall also keep in proper books for that purpose a register of all transactions of the Department of Buildings, which such books shall be open to the inspection of the Mayor, Comptroller, Superintendent of Police, Fire Marshal and members of the City Council at all times

Sec. 217. (Must Keep Account of Fees Paid.—Annual Reports and Estimates.)—Said Commissioner shall keep, in proper books for that purpose, an accurate account of all fees paid, giving the name of the person paying same, date of payment and amount of each such fee. He shall also annually, on or before the first day of February, in each year, prepare and present to the City Council a report showing the receipts and expenditures and entire work of his Department during the previous fiscal year, and he shall at the same time send to the Comptroller a full and comprehensive statement of all matters pertaining to his Department, together with an estimate in detail of the appropriations required by the Department during the current fiscal year.

Sec. 218. (Deputy Commissioner of Buildings.)—There is hereby created the office of Deputy Commissioner of Buildings. He shall be appointed by the Commissioner of Buildings according to law. Whenever the Commissioner of Buildings shall make requisition upon the Civil Service Commission of the city for a person to fill the office of Deputy Commissioner of Buildings, he shall notify the Civil Service Commission that the person certified to fill said office should be a competent civil engineer, architect or builder.

Sec. 219. (Duties.—Bond.)—Said Deputy Commissioner shall pass upon all questions relating to the strength and durability of buildings; shall examine and approve all plans before a building permit is issued for the construction of any building or structure; shall supervise and have charge of all books and records and the various Inspectors employed in the Department of Buildings; shall receive, examine and file all reports made by them, and shall, under the direction and supervision of the Commissioner of Buildings, assign to such Inspectors the work they are to perform. He shall have a book or books in which shall be recorded the location and character of every building for which a permit is issued, and a copy of every report of inspection made for such building, so arranged that the full history of the various inspections of the building shall appear therein in consecutive order, with the name of each Inspector making the inspection thereof and the date of his report. He shall cause to be kept a record of all complaints of violations of the building ordinances, shall report the same to the Commissioner of Buildings, and shall cause all such complaints to be investigated. He shall act as Commissioner of Buildings in the absence of the Commissioner of Buildings from his office, and while so acting shall discharge all the duties and possess all the powers invested in or imposed upon the Commissioner of Buildings.

He shall before entering upon the duties of his office execute a bond to the city in the sum of ten thousand ($10,000) dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of the duties of his office.

Sec. 220. (Assistant Deputy Commissioner of Buildings.—Bond.)—There is hereby created the office of Assistant Deputy Commissioner of Buildings. He shall be appointed by the Commissioner of Buildings according to law. Whenever the Commissioner of Buildings shall make requisition upon the Civil Service Commission of the city for a person to fill the office of Assistant Deputy Commissioner of Buildings, he shall notify the Civil Service Commission that the person certified to fill said office should be a competent civil engineer, architect or builder.

The Assistant Deputy Commissioner of Buildings shall, under the direction of the Commissioner of Buildings or the Deputy Commissioner of Buildings, assist and aid the Deputy Commissioner in the performance of his duties.

The Assistant Deputy Commissioner of Buildings, before entering upon the duties of his office, shall execute a bond to the city in the sum of five thousand ($5,000) dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of the duties of his office.

Sec. 221. (Secretary.—Duties.)—The Commissioner of Buildings shall appoint a Secretary, according to law, whose duty it shall be to preserve and keep, under the supervision and direction of the Deputy Commissioner of Buildings, all books, records and papers belonging to said office or which are required by law to be filed therein. The Secretary shall deliver to the City Council and to the respective departments all communications from said Commissioner, in writing, and perform such services as may be required by said Commissioner or Deputy Commissioner of Buildings.

Sec. 222. (Chief Building Inspector.—Bond.)—There is hereby created the office of Chief Building Inspector. He shall be appointed by the Commissioner of Buildings according to law. Whenever the Commissioner of Buildings shall make requisition upon the Civil Service Commission of the city for a person to fill the office of Chief Building Inspector he shall notify the Civil Service Commission that the person certified to fill said office should be a competent civil engineer, architect or builder.

The Chief Building Inspector shall, under the direction of the Commissioner of Buildings, inspect and examine special cases of violations of the provisions of this chapter, damages to buildings by fire, the elements or accident of any kind whatsoever, and shall perform such other duties as may be required by the Commissioner of Buildings

or the Deputy Commissioner of Buildings. The Chief Building Inspector, before entering upon the duties of his office, shall execute a bond to the city in the sum of five thousand ($5,000) dollars, with such sureties as the City Council shall approve, conditioned for the faithful performance of the duties of his office.

Sec. 223. (Inspectors.—Not to Engage in Business.)—The Inspectors of Buildings, after their appointment to office, shall not be engaged in any other business or vocation.

Sec. 224. (Inspectors.—Duties.—Reports.—How Made.)—The said Inspectors shall, under the direction of the Commissioner of Buildings, examine all buildings in the course of erection, alteration, repair or removal throughout the city at least once a week, or as often as may be required for securing efficient supervision, and shall make written reports to said Commissioner as to all violations of any ordinance of the city which the Department of Buildings is required to enforce, together with the street and number where such violations are found, the names of the owner, agent, lessee, or occupant thereof, and of the architect, contractor and master mechanic, engaged in or about the construction of such building and all other matters relative thereto as far as they can ascertain them.

Inspectors of Buildings shall file daily reports of their work of inspection, which shall be entered in the books to be kept for that purpose, and which shall be open to official inspection at all times.

Sec. 225. (Inspection.—Record of.—How Made.)—The said Inspectors shall examine all buildings and walls reported dangerous or damaged by fire or accident and make a record of such examinations, with the name of the street and number of the building and of the names of the owner, agent, lessee and occupant thereof.

Sec. 226. (Alteration, Enlargement or Raising.—Inspection of.—Other Duties.)—The Inspectors of Buildings shall examine all buildings for which an application to raise, enlarge or alter has been made, and shall make a written report upon the condition of the same to the Commissioner of Buildings before the permit is granted. Said Inspectors shall perform such other duties as may be required of them by said Commissioner of Buildings, the rules and regulations of the Department of Buildings, or the ordinances of the city.

Sec. 227. (Powers—Other.)—The Commissioner and Deputy Commissioner of Buildings, as well as the Inspectors of Buildings and of Elevators, are empowered to enter any building, whether completed or in process of erection, for the purpose of determining whether the same has been or is being constructed in accordance with the terms of this chapter, and it shall not be lawful to exclude them from such buildings.

Sec. 228. (Elevator Inspectors.—Not to Engage in Business.—Duties.)—The Inspectors of Elevators shall not, after their appointment to office, be employed or engaged in any other business or vocation.

The Inspectors of Elevators shall perform such duties as may be required of them by the Commissioner of Buildings, the rules and regulations of the Department of buildings or the ordinances of the city.

ARTICLE II.

PERMITS, PLANS AND FEES.

Sec. 229. (Permits.—When Required.—Limitations of Time For.)—Amended by ordinance Feb. 26, 1906, to read as follows:

Before proceeding with the erection, enlargement, alteration, repair or removal of any building in the city, a permit for such erection, enlargement, alteration, repair or removal shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the erection, enlargement, alteration, repair, or removal of any building or of any structural part thereof within the city unless such permit shall first have been obtained from the Commissioner of Buildings. And, if after such permit shall have been granted, the operations called for by the said permit shall not be begun within six months after the date thereof, or if such operations are not completed within a reasonable time, then such permit shall be void, and no operations thereunder shall be begun or completed until a new permit shall be taken out by the owner or his agent, and fees as herein fixed for the original permit shall be paid for such new permit.

Sec. 230. (Approval of Architects' Plans.)—Amended by ordinance Feb. 26, 1906, to read as follows:

In all cases where a licensed architect shall have completed, signed and affixed his seal to plans, drawings or specifications for any building designed to be erected within the corporate limits of the city, or any structural part thereof, for which a building permit must be procured before the same may be erected, the architect making such plans, drawings, or specifications, shall submit same to the Commissioner of Buildings for examination



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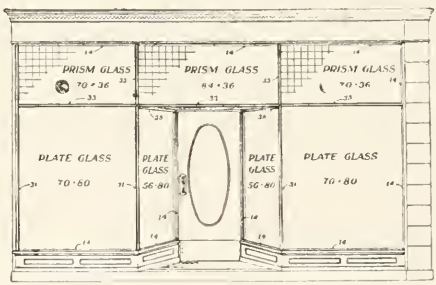
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and approval; and, if the same shall comply with the provisions of this chapter the said Commissioner shall stamp such plans, drawings or specifications in such a manner as to indicate that same have been examined and approved, and the date of such approval, and such stamp shall be preliminary to the final stamp hereinafter provided for.

Said preliminary stamp shall be so affixed before any contract or contracts shall be entered into on behalf of said owner in regard to the construction of said building or buildings on the part of said architect or other person or persons.

Sec. 231. **(Permits.—Application For.—How Made.—How Recorded.—Stamped Plans.—How Cared For.—Return of Same.)**—Amended by ordinance Feb. 26, 1906, to read as follows:

Application for such permits shall be made by the owner or his agent to the Commissioner of Buildings. When such application is made, plans and specifications in conformity with the provisions of this chapter, which have been examined and approved by said Commissioner as hereinbefore provided for, shall be filed with the Commissioner of Buildings, who shall then issue a permit and shall file such application, and shall apply to such plans and specifications a final official stamp, stating that the drawings and specifications to which the same have been applied comply with the terms of this chapter. The plans and specifications so stamped shall then be returned to such applicant. True copies of so much of such plans and specifications as may be required in the opinion of the Commissioner of Buildings to illustrate the features of construction and equipment of the building referred to, shall be filed with the Commissioner of Buildings and shall remain on file in his office until the completion or occupation of such building, after which such drawings and specifications shall be returned by the Commissioner of Buildings to the person by whom they have been deposited with him upon demand. It shall not be obligatory upon the Commissioner of Buildings to retain such drawings in his custody for more than three months after the completion or occupation of the building to which they relate.

Sec. 232. **(Plans.—Essentials Of.)**—All such plans and drawings shall be drawn to a scale of not less than one-eighth of an inch to the foot, on paper or cloth, in ink, or by some process that will not fade or obliterate. All distances and dimensions shall be accurately figured, and drawings made explicit and complete, showing the entire sewerage and drain pipes and location of all plumbing fixtures within such building. Each set of plans presented shall be accompanied by a set of specifications describing all materials to be used in the proposed building, and both the plans and specifications shall be approved by the Commissioner of Buildings before a permit will be granted. No permit shall be granted or plans approved unless such plans shall be signed and sealed by a licensed architect, as provided in "An act to provide for the licensing of architects and regulating the practice of architecture as a profession in the State of Illinois," approved June 3, 1897, provided, that permits may be granted for the erection of buildings of Class III., as hereinafter defined, if such building shall not be more than two stories in height and shall have a superficial area of not more than 1,250 square feet outside dimensions, on plans approved by the Commissioner of Buildings, which plans need not be signed by a licensed architect.

Sec. 233. **(Plans.—Alterations Upon Stamped Plans Not Permitted Without Permission.—Certain Alterations Excepted.)**—It shall be unlawful to erase, alter or modify any lines, figures or coloring contained upon such drawings or specifications so stamped by the Commissioner of Buildings or filed with him for reference. If, during the progress of the execution of such work, it is desired to deviate in any manner affecting the construction or other essentials of the building from the terms of the application, drawing or specification, notice of such intention to alter or deviate shall be given to the Commissioner of Buildings, and his written assent shall first be obtained before such alteration or deviation may be made. Alterations in buildings which do not involve any change in their structural parts or of their stairways, elevators, fire escapes or other means of communication or ingress or egress and that are not in violation of any of the provisions of this chapter may be made without the permission of the Commissioner of Buildings.

Sec. 234. **(Deposit With Water Department.—How Made.—Indemnifying Bond.—Fees for Water Used.)**—Before the Commissioner of Buildings issues a permit as aforesaid he shall require evidence from the applicant that payment has been made to the Bureau of Water of the city for the water to be used or for a water meter for measuring all the water to be used in the construction of such building, under the regulations of the Bureau of Water. Such applicant shall produce evidence that he has filed with and had approved by the Commissioner of Public Works of the City an indemnifying bond protecting the city against any and all damage that may arise to the streets or alleys upon which such building abuts, and to the city and to any person in consequence or by reason of the proposed operations to be authorized by such permit, or by reason of any obstruction or occupation of any street or sidewalk in and about such building operations.

The fees to be paid for water used in connection with the erection of buildings shall be as follows, to wit:

For water to be used in connection therewith at the rate of five cents for every one thousand bricks, wall measure, used in the construction of a building.

At the rate of six cents for every one hundred cubic feet of rubble stone used in connection therewith.

At the rate of eight cents for every one hundred cubic feet of concrete used in connection therewith.

At the rate of fifteen cents for every one hundred yards of plastering used in connection therewith.

At the rate of five cents for every one hundred cubic feet of hollow tile arch, partition or fireproof covering used in any building.

Sec. 235. **(Permits.—Cost of.)**—The fees to be charged for building permits shall be as follows: For sheds not exceeding three hundred square feet in area, two dollars; for open shelter sheds, at the rate of fifty cents for each one thousand cubic feet or part thereof; but in no case shall a permit be issued for a less fee than two dollars.

For all buildings **or structures* other than sheds and open shelter sheds, as hereinbefore described, the fee for the permit shall be at the rate of ten cents for every one thousand cubic feet or fractional part thereof contained therein, the cubic contents being measured to include every part of the building from the basement floor to the highest point of the roof and to include all bay-windows and other projections; but in no case shall any permit be issued for a less fee than two dollars, *except that for a permit for shingling a roof of any building the fee shall not exceed one dollar.*

As amended by ordinance of June 5, 1906.

*As amended Nov. 25, 1907.

Section 1. That Section 235 of the Revised Municipal Code of Chicago of 1905, as amended June 5, 1906, be and the same is hereby amended by inserting in line 6 of said section, after the word "buildings," the words "or structures."

Section 2. This ordinance shall be in force and effect from and after its passage.—As amended Nov. 25, 1907.

Sec. 236. **(Permit for Alterations and Repairs.—Cost Of.)**—The fee to be charged for permits issued for alterations and repairs in or to any building or structure shall be as follows:

Where such alteration or repair shall equal fifty per cent. or more of the original building or structure to be altered or repaired, or of such part or portion of such building or structure to be altered or repaired, the same fees shall be charged as if such permit were for the construction of a new building.

Where such work of alteration or repair shall be less than fifty per cent. of the original building or structure or of the part or portion to be altered or repaired, the fee to be charged for a permit for such work shall be half that charged for the issuance of a permit for new work.

Sec. 237. The fee for a permit to raise a frame building shall be one dollar.

Sec. 238. **(Permits for Raising or Moving Buildings Other Than Frame.)**—The fee for a permit to raise or move a building other than a frame building shall be two ($2) dollars for every twenty-five (25) feet, or fractional part thereof, of frontage, and when such building is to be moved from one location to another it shall be altered or reconstructed so as to conform to the ordinances governing the construction of such building at the time of moving the same.

Sec. 238a. **(Permit for Wrecking Building.)**—Amended by ordinance of Dec. 2, 1907 (Superseding amendatory ordinance of Dec. 11, 1905), to read as follows:

Before proceeding with the wrecking or tearing down of any building or structure, a permit for such wrecking or tearing down shall first be obtained by the owner or his agent from the Commissioner of Buildings, and it shall be unlawful to proceed with the wrecking or tearing down of any building or structure or any structural part thereof within the City unless such permit shall first have been obtained. Application for such permit shall be made by such owner or his agent to the Commissioner of Buildings, who shall issue such permit upon such application and the payment of the fee herein provided for. Such application shall state the location and describe the building which it is proposed to wreck or tear down. The fee for such permit shall be two dollars for every twenty-five feet, or fractional part thereof, of frontage. Upon the issuance of such permit such building may be wrecked or torn down, provided that all the work done thereunder shall be subject to the supervision of the Commissioner of Buildings, and shall be performed under the same restrictions as govern the erection of buildings.

Any person, firm or corporation engaged in the business of wrecking buildings within the City limits shall file with the City Clerk of the City of Chicago an approved bond in the sum of twenty thousand dollars ($20,000) *to indemnify the City against any lawsuits*

brought or judgments obtained against the City of Chicago, or any of its officers, resulting from accidents to persons or property during wrecking operations, and shall also procure a contractor's license.

(The penalties prescribed by Section 738, for violations, shall apply with equal force and effect to violations of this section.)

Sec. 239. **(Permit.—Revocation Of.)**—If work in, upon or about any building shall be conducted in violation of any of the provisions of this chapter, it shall be the duty of the Commissioner of Buildings to revoke the permit for the building operation in connection with which such violation shall have taken place. It shall be unlawful, after the revocation of such permit, to proceed with such building operations unless such permit shall first have been reinstated or reissued by the Commissioner of Buildings. Before a permit so revoked may be lawfully reissued or reinstated the entire building and building site shall first be put into condition corresponding with the requirements of this chapter, and any work or material applied to the same in violation of any of the provisions of this chapter shall be first removed from such building.

ARTICLE III.

CLASSIFICATION OF BUILDINGS.

Sec. 240. **(Buildings.—Classes Of.)**—All buildings (other than sheds and shelter sheds, as hereinafter described) now existing or hereafter constructed, altered or enlarged within the city, shall be classified as follows:

Sec. 241. **(Class I.)**—In Class I. shall be included every building used for the sale, storage or manufacture of merchandise, other than department stores, as described in Section 247 of this chapter, and all stables covering or occupying a ground area of over five hundred square feet.

Sec. 242. (Class II.)—In Class II. shall be included every office building, hospital and every building used for hotel purposes or for boarding or lodging house purposes where such building so used for hotel or boarding or lodging house purposes is occupied by twenty or more persons.

Sec. 243. **(Class III.)**—In Class III. shall be included every building used as a family residence, also every building used for stabling purposes where such building so used shall occupy a ground area of less than five hundred square feet.

Sec. 244. **(Class IV.)**—In Class IV. shall be included every building used as an assembly hall, whether such hall is used for the purpose of worship, instruction or entertainment, unless such building is used for any of the purposes for which buildings of Class V. or Class VIII. are used.

Sec. 245. **(Class V.)**—In Class V. shall be included every building which is used as a public theater where an admission fee is charged and in which movable scenery is used; provided, however, that public halls and club halls with a seating capacity of less than six hundred, although occasionally used for theatrical representations, shall not be construed to be public theaters within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stage thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V. as herein defined. Such public halls and club halls shall be included in Class IV., as defined in Section 244 of this chapter.

Sec. 246. **(Class VI.)**—In Class VI. shall be included every tenement and apartment house; that is to say, any house or building or portion thereof which is used as a home or residence for two or more families living in separate apartments.

Sec. 247. **(Class VII.)**—In Class VII. shall be included all buildings used for the sale at retail of dry goods and other articles of general merchandise and commonly known and described as "department stores."

Sec. 248. **(Class VIII.)**—In Class VIII. shall be included every building used exclusively for school purposes.

Sec. 249. **(Buildings Used for the Purposes of More Than One Class.)**—Where any building is used for the purposes of two or more classes as herein specified and defined, such portion of any such building as is devoted to the uses and purposes of any particular class shall be constructed, operated and maintained in accordance with the requirements of this chapter relating to such class, unless such construction shall prove impracticable or unless there would be a conflict between the provisions of this chapter relating to the construction of buildings; in either of which such cases the provisions relating to and governing the construction of buildings of the class requiring the best and safest form of construction shall govern.

Sec. 250. **(Conflict Between Special and General Provisions.)**—Whenever any provision or requirement of this chapter relating specifically to the construction, equipment, maintenance or operation of any building or part of a building used for the

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purposes of any specified class shall conflict with the general provisions of this chapter relating to the construction, operation and equipment of buildings generally, the special provisions shall govern in each case, except in the case of Section 634, which shall govern in all cases coming within its provisions.

ARTICLE IV.

PROVISIONS RELATING SOLELY TO CLASS I.

In Class I. shall be included every building used for the sale, storage or manufacture of merchandise other than department stores, as described in Sections 60 and 700, and all stables covering or occupying a ground area of over five hundred square feet.

Sec. 251. **(Walls of Class I.—Thickness Of.)**—The thickness of surrounding walls and of all dividing walls in every building used wholly or in part for the purposes of Class I. shall be made as indicated in the following table, to wit:

		STORIES											
	Basement.	1	2	3	4	5	6	7	8	9	10	11	12
One-story	12	12											
Two-story	16	12	12										
Three-story	16	16	12	12									
Four-story	20	20	16	16	12								
Five-story	24	20	20	16	16	16							
Six-story	24	20	20	20	16	16	16						
Seven-story	24	20	20	20	20	16	16	16					
Eight-story	24	24	24	20	20	20	16	16	16				
Nine-story	28	24	24	24	20	20	20	16	16	16			
Ten-story	28	28	28	24	24	24	20	20	20	16	16		
Eleven-story	28	28	28	24	24	24	20	20	20	16	16	16	
Twelve-story	32	28	28	28	24	24	24	20	20	20	16	16	16

Provided, however, in buildings of steel skeleton fireproof construction thickness of walls shall be governed by Section 510 of this chapter.

Sec. 252. **(Buildings.—Height and Construction Of.)**—Buildings of Class I. which are one hundred feet or more in height shall be built entirely of fireproof construction.

Buildings of Class I. less than one hundred feet and more than sixty feet in height shall be built entirely of slow-burning, mill or fireproof construction.

No building of Class I. more than five stories in height shall be permitted to be built of ordinary construction.

Sec. 253. **(Walls.—Exception to Table of Thickness Of.)**—If buildings of Class I. are erected of less depth than 100 feet from front to rear or between cross walls, or if the walls supporting their floors and roofs are less than twenty-five feet apart, the thickness of the walls given in the aforesaid table may be reduced by four inches, excepting only that no wall in such buildings shall be less than twelve inches thick.

Sec. 254. **(Walls.—Metal Lath, and Solid Cement Plaster Covering.)**—A one or two-story building used for the purposes of Class I., no part of which is within twenty feet of any lot line, alley line or street line, having a complete self-supporting steel frame consisting of wall columns supporting steel trusses, with steel trusses and steel diagonals designed to resist safely within the safe limits of stress provided by this chapter a wind pressure of thirty pounds per square foot for each and every exterior surface exposed to the wind, in addition to the dead weight of the completed structure and in addition to the live load of one hundred pounds per square foot provided for by this chapter and any other live loads which may be imposed on said structure, may have exterior walls measuring not less than one and one-third inches thick of metal, lath or metal fabric plastered on both sides with a mortar consisting only of Portland cement and torpedo sand. A complete reinforced concrete framework built in every manner equally as strong and as safe as provided for a steel frame in this section may have exterior walls built in the same manner of the same materials and of the same thickness.

Sec. 255. **(Door Openings at Street Level.—Class I.)**—The aggregate width of door openings at the street level in buildings of Class I. shall be equal to the aggregate width of stairways, as specified in Section 265 of this chapter, and such doors shall not be locked during business hours or while such buildings are occupied by a number of persons for any purpose. Revolving doors shall not be considered as complying with this section, *unless the revolving wings of said revolving doors are so arranged that by the application of a force slightly more than necessary to revolve said doors and which one person of ordinary strength is capable of exerting, all the wings of said doors fold flat on*

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each other and in an outward direction, and unless each side, or the half circles of such revolving doors, are hinged and fastened so as to likewise swing backwards on application of force slightly beyond the normal, and which will permit of exit space for two ordinary persons on either side of the collapsed wings of said revolving doors and their inclosing half circles.

As amended by ordinance March 30, 1906.

Sec. 256. **(Buildings of Class I.—Increasing Height Of.)**—In all cases where buildings of Class I., of ordinary construction, already built, are to be increased in height above the height of sixty feet or above the height of one hundred feet, the additional parts of such buildings shall be constructed as herein provided for buildings over sixty feet high or over one hundred feet high, respectively, and shall be made to conform in all respects and throughout their entire extent to the requirements for buildings of this class more than sixty feet or more than one hundred feet high, respectively, before it shall be lawful to occupy them.

Sec. 257. **(Ceilings and Roof of Class I.—Space Between.)**—In buildings of Class I., if the inclosed space between the ceiling and the roof is of greater average height than two feet, easy and convenient means of access, satisfactory to the fire marshal, shall be given to such space.

Sec. 258. **(Fire Walls.—In Buildings of Class I.)**—Buildings occupied by more than one person or corporation, or for more than one business enterprise conducted by the same person or corporation, in separate inclosures on any one floor, shall have a brick dividing wall for every fifty (50) feet of street frontage if of ordinary construction, or for every eighty (80) feet of street frontage if of slow-burning or mill construction, and such dividing walls shall extend from the front to the rear wall, and such dividing walls, and the doors therein shall be built as dividing walls, and the doors therein are required to be built by the provisions of this chapter.

All of the partitions between the parts of such buildings, occupied by different persons or corporations shall be built of incombustible material from the floor to the floor boards or roof boards next above such story or stories so occupied.

Only metal framed windows glazed with one-quarter inch thick fire-resisting glass may be used in such partitions.

Sec. 259. **(Dividing Walls.—When Required in Class I.)**—Dividing walls will be required in buildings of Class I. as follows: For buildings of ordinary construction if their floor area exceeds nine thousand square feet; for buildings of slow-burning or mill construction more than one story in height if their area exceeds twelve thousand square feet; for fireproof buildings more than two stories in height, if their area exceeds twenty-five thousand square feet. In each of the before mentioned cases such buildings shall be subdivided by brick walls built of the thickness given in the table for the thickness of inclosing walls, and all doors and other openings in such walls shall have iron doors or shutters at each side of same. The buildings so subdivided shall be treated as regards stairs and fire escapes the same as two or more separate buildings, provided, however, one-story buildings of ordinary, mill or slow-burning construction or two-story buildings of fireproof construction of any size, used as one store, room or workshop and occupied by only one person or corporation, may be erected without any dividing walls.

Sec. 260. **(Dividing Walls and Iron Doors.—Openings Inserted In.)**—If openings are to be inserted in dividing walls, as before described, or in dividing walls between non-fireproof and fireproof buildings or parts of either of such buildings, they shall be made as follows:

They shall have doors placed on each side of each opening in such walls, which doors shall be made of No. 12 plate iron with a continuous 2 by 2 by one-half-inch angle iron frame extending all around the same and the plate riveted thereto with one-half-inch rivets, placed four inches between centers. If such doors are made double they shall have cross bars, levers and hooks so arranged that when the doors are closed they will be of strength equal to that of a single door. All doors shall be hung on frames made of three-quarter by 4-inch iron stiffened with an angle iron extending all around the same and fitting up snug to the wall. The frames shall be fastened to each other by bolts extending through the wall, such bolts being not more than two feet apart, and such doors shall swing on three hinges and shall be made to fit closely to the frame all around. The sills between the doors shall be of brick, iron, stone or concrete and shall rise at least two inches above the floor on each side of each opening. The lintel over the door shall be made of brick or iron, and the wall between the two door frames shall be covered with a coat of plaster at least one-half inch thick.

Sec. 261. **(Elevator Buildings.—Bins Of.)**—Elevator buildings (which term shall be interpreted as including all buildings intended solely for the receipt, storage and

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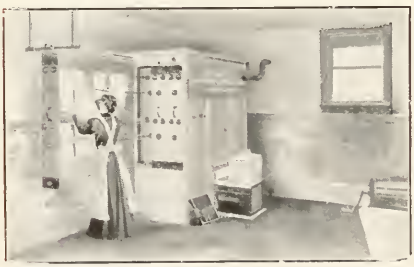
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delivery of grain in bulk) may be constructed with the bin walls, both externally and internally, made entirely of wood; provided such walls are made solid and without cellular open spaces within them. The external bin walls shall have a covering of brick or hollow tile not less than twelve inches thick, which shall be united to the bin walls by anchors, in the construction and arrangement of which due allowance is made for the variations of shrinkage of the inclosing wall and of the wooden bin wall. If the weight of the bins is independently carried on a skeleton construction of timber, steel or iron, the first-story walls shall be of brick not less than twenty inches thick. If the outer walls of the outside bins and their facing are not carried on a skeleton construction, then the first-story wall shall not be less than twenty-eight inches thick, or as much thicker as may be required to keep the load upon the brickwork within the limits of stress elsewhere specified in this chapter. Elevator buildings may be built of reinforced concrete and in such case they shall be built according to the provisions of Section 554 of this chapter.

Sec. 262. **(Cupola.—Inclosing Walls Of.—Openings.)**—The inclosing walls of cupolas on elevator buildings, if constructed of wood, shall be covered with corrugated iron or other incombustible material.

The outside openings in elevator buildings shall have protections of wire netting made of No. 14 wire, with meshes not over one-half by one-half inch.

All openings in the body of the first story of elevator buildings and the openings in the engine and boiler houses of the same and between these and the main building shall have iron doors made in accordance with the provisions of Section 260 of this chapter.

Sec. 263. **(Ventilating Ducts.—Chutes.—Walls Surrounding.)**—Walls surrounding ventilating ducts and rubbish and ash chutes shall be constructed in accordance with the regulations governing the construction of smoke flues elsewhere herein contained. Walls around ventilating ducts shall not be less than four inches thick, and when the ventilating duct is larger than 260 square inches the walls shall be not less than eight inches thick.

Sec. 264. **(Store Fronts.—Columns and Lintels Supporting.)**—The columns and lintels supporting store fronts in buildings within the fire limits of more than one story in height shall be made of incombustible material.

Sec. 265. **(Stairs in Buildings of Class I.—Number and Width of.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

There shall be in all buildings of Class I of ordinary construction two flights of stairs not less than three feet wide each. For buildings of ordinary construction of Class I and of greater floor area than three thousand square feet, there shall be six inches added to the width of each such flight of stairs for each additional one thousand square feet of floor area or fractional part thereof up to nine thousand square feet of floor area.

Every Class I building of slow-burning or mill construction less than 4,000 square feet floor area shall have two flights of stairs, not less than three feet wide each, and there shall be six inches added to the width of each such flight of stairs for each additional one thousand square feet of floor area, or fractional part thereof, up to twelve thousand square feet. Provided, however, that additional flights of stairs may be used to make the aggregate width required, instead of widening the two flights above mentioned. It is further provided, however, that such stairs may be reduced one foot in width for each four stories in height or fractional part thereof, above the fourth story of such building, but such stairs shall in no case be of less width than three feet.

For fireproof buildings there shall be required two flights of stairs not less than three feet wide for the first three thousand square feet of floor area, or fractional part thereof. For buildings of more than three thousand square feet and not exceeding five thousand square feet of floor area, there shall be required two flights of stairs each not less than three feet six inches in width. For more than five thousand square feet and less than ten thousand square feet of floor area, there shall be an additional flight of stairs not less than three feet in width. For more than ten thousand square feet and less than fifteen thousand square feet of floor area, each of such stairs shall be of not less width than five feet. For more than fifteen thousand square feet and less than twenty-five thousand square feet of floor area there shall be not less than three stairways of an aggregate width of fifteen feet; none of such stairs shall be of less width than three feet.

The width of the different stairways need not be alike. The width of each stairway in the fifth, sixth, seventh and eighth stories may be six inches less in the clear than the width of the stairways in the first to the fourth stories, inclusive.

The width of each stairway in the ninth, tenth, eleventh and twelfth stories may be twelve inches less in the clear than the width of the stairways in the first to the fourth stories, inclusive.

The width of each stairway in the thirteenth, fourteenth, fifteenth and sixteenth stories may be eighteen inches less in the clear than the width of the stairways in the first to the fourth stories, inclusive, and this reduction in width may be continued in the same ratio in each additional four stories added to the height of the building; provided, however, that no stairways shall have a less clear width than three feet.

All stairways in buildings of Class I shall have a hand rail on each side thereof, and where there is more than one stairway in any building of Class I, such stairways shall be located at each end of the building, or as far apart from each other as is practicable.

The width of the different stairways need not be alike. The width of each stairway in the fifth, sixth, seventh and eighth stories may be six (6) inches less in the clear than the width of the stairways in the first to the fourth stories, inclusive.

The width of each stairway in the ninth, tenth, eleventh and twelfth stories may be twelve (12) inches less in the clear than the width of the stairways in the first to the fourth stories, inclusive.

The width of each stairway in the thirteenth, fourteenth, fifteenth and sixteenth stories may be eighteen (18) inches less in the clear than the width of the stairways in the first to the fourth stories, inclusive, and this reduction in width may be continued in the same ratio in each additional four (4) stories added to the height of the building; provided, however, that no stairway shall have a less clear width than three (3) feet.

All stairways in buildings of Class I. shall have a hand rail on each side thereof, and where there is more than one stairway in any building of Class I. such stairways shall be located at each end of the building, or as far apart from each other as is practicable.

Doors and Windows.—When required to be closed, fire-resisting glass. See Section 632.

Limitations In Changing Class of Buildings.—See Section 633.

Buildings Used for the Purposes of More Than One Class.—See Section 249.

Sec. 266. **(Courts, Light Shafts and Well Holes.)**—Courts, light shafts and well holes shall be built in accordance with the provisions of Section 455 of this chapter.

Sec. 267. **(Loads.—Allowance for Live Loads in Construction of Floors of Class I.)**—The floors of all buildings of Class I shall be designed and constructed in such a manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, of partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floor; and the strength of such building shall be increased above the capacity to carry such a live load of one hundred pounds per square foot of floor surface when the uses to which such building or part thereof is to be applied involve greater stress.

Sec. 268. **(Floors.—Display of Placard Indicating Strength Of.)**—It shall be the duty of the owner of every building of Class I. already constructed, or hereafter to be constructed, or of his agent, or of the occupant or person in possession, charge or control of the same, to affix and display conspicuously on each floor of such building a placard stating the load per square foot of floor surface which may with safety be applied to that particular floor, or if the strength of different parts of any floor varies, then there shall be such placards for each varying part of such floor. It shall be unlawful to load any such floors, or any part thereof, to a greater extent than the load indicated upon such placards. It shall be the duty of occupants of buildings to maintain such placards during their occupation of the premises, and the owners of buildings, or their agents, to cause the same to be properly affixed with each change of occupation. It shall be part of the duty of architects of all buildings to calculate the figures for such placards, which are to be verified and approved by the Commissioner of Buildings before they are affixed upon the respective floors of the different buildings.

Walls.—Ledges.—See Section 588.

Walls.—Around Stairs, Elevators and Shafts. See Section 588.

Walls.—Reinforced concrete. See Section 554.

Towers.—Domes.—Spires.—See Section 613.

ARTICLE V.

PROVISIONS RELATING SOLELY TO CLASS II.

In Class II. shall be included every office building, every hospital and every building used for hotel purposes, or for boarding or lodging house purposes, where such building so used for hotel, hospital or boarding or lodging house purposes is occupied by twenty or more persons.

Sec. 269. **(Walls of Class II.)**—The thickness of the walls of buildings of Class II. shall conform to the following requirements:

The thickness of the enclosing walls of buildings of this class shall be made in accordance with the following table, to-wit:

		STORIES											
	Basement.	1	2	3	4	5	6	7	8	9	10	11	12
Basement and	12	8											
Two-story	12	12	8										
Three-story	16	12	12	12									
Four-story	20	16	16	12	12								
Five-story	20	16	16	16	12	12							
Six-story	20	20	16	16	16	12	12						
Seven-story	24	24	20	20	16	16	12	12					
Eight-story	24	24	24	20	20	16	16	12	12				
Nine-story	28	24	24	20	20	20	16	16	12	12			
Ten-story	28	24	24	24	20	20	20	16	16	12	12		
Eleven-story	28	28	24	24	24	20	20	20	16	16	12	12	
Twelve-story	32	28	28	24	24	24	20	20	20	16	16	12	12

Provided, however, in buildings of steel skeleton fireproof construction, thickness of walls shall be governed by the provisions of Section 510 of this chapter.

Sec. 270. **(Buildings.—Construction Of.—Height Of.)**—Buildings of Class II. which are one hundred feet or more in height shall be built entirely of fireproof construction.

Buildings of Class II. less than one hundred feet and more than sixty feet in height shall be built entirely of slow-burning, or mill or fireproof construction. Buildings of Class II. not exceeding four stories in height and less than sixty feet in height may be built of ordinary construction.

Sec. 271. **(Walls.—Division and Partitions in Boarding or Lodging Houses and Hotels.)**—In buildings used wholly or in part for boarding houses, lodging houses or hotels, sixty feet or less in height, there shall be for every eight rooms in any one story dividing walls or partitions of incombustible material, separating such eight rooms from the contiguous spaces. Partitions surrounding stairs and corridors shall be made of fireproof material.

Sec. 272. **(Stairs in Buildings of Class II.)**—Stairs in Buildings of Class II. shall be adapted, in number and width, to the area, height and to the uses to be made of the building in which they occur.

For office buildings, by which shall be understood buildings divided into apartments intended for business uses only, and in which there shall be no sleeping apartments whatever, there shall be in buildings of ordinary construction and of less ground area than three thousand square feet, two flights of stairs not less than three feet wide each; for office buildings of ordinary construction and of greater floor area than three thousand square feet, there shall be six inches added to the width of each such flight of stairs for each additional one thousand feet of floor area, or fractional part thereof, up to six thousand square feet of floor area; for office buildings of ordinary construction and of greater floor area than six thousand square feet, there shall be an additional flight of stairs not less than three feet wide for each additional three thousand square feet of floor area, or fractional part thereof.

For office buildings of slow-burning or mill construction there shall be at least two flights of stairs three feet wide each for the first four thousand square feet of floor area, and there shall be six inches added to the width of each such flight of stairs for each additional one thousand square feet of floor area, or fractional part thereof, up to eight thousand square feet of floor area; and an additional flight of stairs not less than three feet wide shall be required for each additional four thousand square feet of floor area, or fractional part thereof, above eight thousand square feet.

For fireproof office buildings there shall be required one flight of stairs not less than four feet in width for the first three thousand square feet of floor area, or fractional part thereof.

For fireproof office buildings of more than three thousand, and not exceeding five thousand square feet of floor area, there shall be required one flight of stairs not less than five feet in width.

For more than five thousand and less than ten thousand square feet of floor area there shall be required an additional flight of stairs not less than three (3) feet in width.

For more than ten thousand and less than twenty thousand square feet of floor area there shall be required two flights of stairs of not less width than five (5) feet each; provided, that for each and every fireproof office building of more than ten thousand square feet floor area there shall be at least two stairway fire escapes, placed as far apart as practicable, on such buildings, in addition to the standpipe and platform fire escape required by this chapter and the statutes of this state.

An additional flight of stairs shall be required for each additional ten thousand square feet of floor area; provided, that for each additional five thousand square feet of floor area such stairway shall be not less than three feet wide.

And for additional floor areas between five thousand and ten thousand square feet such stairway shall be not less than five feet in width. The width of the different stairways need not be the same.

Sec. 273. **(Hospitals, Hotels, Boarding or Lodging Houses.—Stairways.—Fire Stops.)**—For all buildings of Class II. of ordinary construction used as hotels, boarding or lodging houses, or hospitals, there shall be required for each building at least two flights of stairs, which, for buildings of three thousand square feet or less in floor area, shall be of not less width than three feet each, with an increase of six inches in width for each additional one thousand square feet of floor area, or fractional part thereof, up to a floor area of five thousand square feet; and after that there shall be an additional flight of stairs not less than three feet wide for each additional two thousand feet of floor area, or fractional part thereof.

For all buildings of Class II. of slow-burning or mill construction used as hospitals, hotels, boarding or lodging houses, there shall be required for each building at least two flights of stairs, which, for buildings of four thousand square feet or less in floor area, shall be of not less width than three feet each, with an increase of six inches in width for each additional one thousand square feet of floor area, or fractional part thereof, up to a floor area of six thousand square feet; and after that there shall be an additional flight of stairs not less than three feet wide for each additional three thousand feet of floor area, or fractional part thereof.

For all buildings of Class II. of fireproof construction used as hospitals, hotels, boarding or lodging houses, there shall be required for each building at least two flights of stairs, which, for buildings of five thousand square feet or less in floor area, shall be of not less width than three feet each, with an increase of five inches in width for each additional one thousand square feet of floor area up to a floor area of ten thousand square feet, and there shall be required an additional flight of stairs not less than three feet wide for each additional four thousand square feet of floor area, or fractional part thereof.

Each stairway in the fifth, sixth, seventh and eighth stories may be built six (6) inches less in width in the clear than the stairways in the first to the fourth stories, inclusive.

Each stairway in the ninth, tenth, eleventh and twelfth stories may be built twelve (12) inches less in width in the clear than the stairways in the first to the fourth stories, inclusive.

Each stairway in the thirteenth, fourteenth, fifteenth and sixteenth stories may be built eighteen (18) inches less in width in the clear than the stairways in the first to the fourth stories inclusive, and this reduction in width may be continued in the same ratio in each additional four (4) stories added to the height of the building; provided, however, that no stairways shall have a less clear width than three (3) feet.

All stairways in buildings of Class II. shall have a hand rail on each side thereof, and where there is more than one flight of stairs in any building of Class II., such stairways shall be located at each end of the building, or as far apart from each other as is practicable.

In hotels, hospitals, lodging houses or boarding houses, of other than fireproof construction, there shall be a fire stop of brick, concrete or tile, between the ceiling and floor in each floor of joists for each twenty-five feet, or fractional part thereof, measured in the direction of the length of the joists.

Sec. 274. **(Air.—Means of Communication With Outer Air in Buildings of Class II.)**—Amended by ordinance of Oct. 22, 1906, to read as follows:

In all buildings of this class, the fire escape, stairs, stair halls, entrance halls, bay windows, vent shafts, courts, lights in halls, porches, windows in public halls, shall be of the size and dimensions as are prescribed in Sections 392, 400, 402, 404, 412, 415, 416, 417, 418, 419, 420, 421, 422, *and* 423 *of this chapter relating to buildings of Class VI.*

Where vent shafts as defined in Section 389 *of this ordinance, are used to ventilate water closet compartments, bath rooms, or pantries, of hotels, office buildings, or club houses, they shall be of the following dimensions:*

Building	*Square feet*	*Least width*
2 *stories*	22½	3 *feet*
3 *stories*	27	3 *feet*
4 *stories*	36	3 *feet*
5 *stories*	48	5 *feet*
6 *stories*	72	6 *feet*
7 *stories*	96	8 *feet*
8 *stories*	120	8 *feet*

In every hotel, office building, or club house, hereafter erected, and every hotel, office building, or club house, which shall be increased or diminished in size, or otherwise altered after its erection, and in every building, now or hereafter in existence, not now used as a hotel, office building or club house, but hereafter constructed or altered to such use, and every habitable room, excepting water closet compartments, bathrooms and pantries, shall have at least one window opening directly upon a street, alley, yard, or court. The total area of the windows opening from any such room (other than water closet compartments, bathrooms and pantries), shall be, at least one-tenth the floor area of that room, and the top of, at least, one window shall be not less than seven feet above the floor, and the upper half of that window shall be made so as to open its full width. No window in any such room (other than pantries, water closet compartments and bath rooms), shall have less than ten square feet of glass area. Every such water closet compartment, bathroom or pantry, shall have a window not less than one foot wide and of an area of, at least, four square feet for a floor area of forty-five square feet or less opening directly into the outer air, or special light or air shafts, into which no other rooms, or compartments, other than toilet compartments, bathrooms, or pantries, are ventilated. For upwards of forty-five square feet of floor area there shall be a window area of at least one-tenth of the floor area. The windows in all cases shall be arranged so as to admit of their being opened at least one-half of their height. The urinal, bath or water closet compartments on the top floor of any building may be lighted and ventilated by means of a skylight and ventilator. The area of the skylight shall conform to the above specified areas for windows.

It is provided that in hotels, office buildings and club houses, the bathroom, water closet and urinal compartments, may be ventilated by exhausting the air from the same at the rate of at least six complete changes of air from each room per hour by approved positive mechanical means through special air ducts to the outer air. The special ventilating duct or ducts, together with their branches, shall be of such size or sizes as to provide for the required changes of air from each of such rooms.

It shall be the duty of the owner, agent, architect, or of the party in possession or control of the same to notify the Commissioner of Health in writing twenty-four hours in advance when any such system is completed, for the supervision of the test.

When the installation of the mechanical ventilating system for toilet and bathrooms is complete, and the ventilating appliances are being operated at their normal capacities, they shall be tested by the party notifying for test for volumetric efficiency in the presence of, and under the direction of, the Chief Sanitary Inspector of the Department of Health.

The mechanical ventilating system shall at all times be kept in good repair and in operation to insure the required ventilation during the hours when the above specified buildings are used for human occupancy.

All such toilet or bathrooms as mentioned in this section, shall have a fixed window, or windows, having a gross glass area and equal to at least one-eighth of the floor area of rooms. The windows are to be provided and placed in the dividing or enclosing partitions, and shall be suitably arranged so as to admit of natural light from an adjoining room which has direct communication to the outside air. All such rooms or compartments shall have proper means for artificially lighting the same, and they shall be properly and adequately lighted by natural or artificial means during the occupancy of the building.

Sec. 275. **(Joists.—Supports For.)**—If in buildings of Class II. the distance between the enclosing walls is more than twenty-four feet in the clear, there shall be intermediate supports for the joists, which supports shall be either brick walls or iron or steel columns and beams or trusses or girders. If brick walls are used for this purpose, they may, in all cases where the thickness of walls is given in the table as sixteen inches or more, be made four inches less in thickness than the dimensions stated in the table.

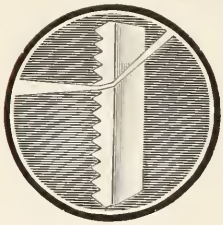
Sec. 276. **(Loads.—Allowance for Live Loads in Construction of Floors of Class II.)**—For all buildings of Class II. the floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of the floor construction, partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of fifty pounds for every square foot of surface in such floors.

Sec. 277. **(Stalls or Rooms of Class II.—When Considered Habitable.)**—In buildings of Class II. no room shall be considered habitable or used as a habitation unless it has at least one window of an area equal to one-tenth of the superficial area of such room, opening into the external air. Provided, however, that no stall or compartment used as a sleeping room in a building, the walls of which stall or compartment do not extend within a distance of two and one-half feet from the ceiling thereof, shall be regarded and considered to be a room within the intent and meaning of the provisions hereof, but the walls of every such stall or compartment shall be of incombustible material.

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Sec. 278. **(Hospitals.—Construction.—Height Of.—Permits.—Special Consents.)**—It shall be unlawful for any person or corporation to build, construct, maintain, conduct or manage in any block, if two-thirds of the buildings fronting upon both sides of the streets bounding such block or square are devoted chiefly to residence purposes, any hospital for the care, treatment or nursing of three or more insane persons; or any hospital for the care, treatment or nursing of three or more inebriates, or persons suffering from the effect of the excessive use of alcoholic liquors; or any hospital for the care, treatment or nursing of three or more epileptics; or any hospital for the care, treatment or nursing of three or more persons addicted to, or suffering from, the excessive use of morphine, cocaine or other similar drugs or narcotics; or any hospital for the care, treatment or nursing of any person affected with any infectious or contagious disease, unless the owners of a majority of the frontage in such block or square, and in addition thereto the owners of a majority of the frontage on the opposite sides of the streets bounding such block or square, consent in writing to the building, constructing, maintaining, managing or conducting of any such hospital in such block or square. Such written consents of the majorities of such property owners shall be filed with the Commissioner of Buildings, and an exact copy of same shall be filed with the Commissioner of Health before a permit shall be granted for the building or constructing, or a license issued for the maintaining, conducting or managing of any such hospital. Provided, that any building that may be used for hospital purposes which is over two stories in height shall be of fireproof construction throughout, and no hospital shall be built to exceed six stories in height.

Sec. 279. **(Hospitals.—Location of Near School Houses.)**—No hospital of any kind or description hereafter erected or established shall be erected or established within four hundred feet of property used for school purposes. (Note: This section is repealed by ordinance of June 1, 1908, page 509, governing hospitals, [Sections 1102, etc.])

(Walls.—Ledges.—Joist Supports.—All ledges in walls shall be as specified in Section 588 of this chapter.

Walls.—Reinforced concrete. See Section 554.

Sec. 280. **(Roofs.—Strength Of.)**—The roofs of buildings of Class II. shall be designed and constructed as is required in Section 610.

Roofs.—Shingle.—See Section 609.

Towers, Domes and Spires.—Construction Of.—See Section 613.

Skylights.—Construction, Glass In. See Section 614.

Bay Windows and Light Shafts.—Material for. See Section 600.

Doors and Windows.— When required to be closed.—Fire resisting glass. See Section 632.

Wind Pressure.—Precautions against. See Section 603.

Windows.—Cleaning, safety devices. See Section 726.

Buildings Used for the Purposes of More than One Class.—See Section 249.

Limitations in Changing Class of Buildings.—See Section 633.

Walls.—Around Stairs, Elevators and Shafts.—See Section 588.

ARTICLE VI.

PROVISIONS RELATING SOLELY TO CLASS III.

In Class III. shall be included every building used as a family residence; also every building used for stabling purposes, where such building so used shall occupy a ground area of less than five hundred square feet.

Section 281. **(Walls of Class III.—Thickness of.)**—Buildings of Class III. shall conform to the following requirements:

The thickness of enclosing walls of buildings of this class shall be in accordance with the following table, to wit:

		STORIES										
Basement.	1	2	3	4	5	6	7	8	9	10	11	12
Basement and 12	8											
Two-story 12	12	8										
Three-story 16	12	12	12									
Four-story 20	16	16	12	12								
Five-story 20	16	16	16	12	12							
Six-story 20	20	16	16	16	12	12						
Seven-story 24	24	20	20	16	16	12	12					
Eight-story 24	24	24	20	20	16	16	12	12				
Nine-story 28	24	24	20	20	20	16	16	12	12			
Ten-story 28	24	24	24	20	20	20	16	16	12	12		
Eleven-story 28	28	24	24	24	20	20	20	16	16	12	12	
Twelve-story 32	28	28	24	24	24	20	20	20	16	16	12	12

Provided, however, in buildings of steel skeleton fireproof construction, thickness of walls shall be governed by the provisions of Section 510 of this chapter.

Sec. 282. (Buildings.—Construction Of.—Height Of.)—Buildings of Class III. which are one hundred feet or more in height shall be made entirely of fireproof construction.

Buildings of Class III. less than one hundred feet and more than sixty feet in height shall be built entirely of slow-burning mill or fireproof construction.

Buildings of Class III. less than sixty feet in height may be built of ordinary construction.

Sec. 283. (Skylights.—Construction Of.—Glass In.)—The skylight on the roof of any building of Class III., other than a frame building, shall have the sides, sashes and frames constructed of metal, or of wood metal clad on all exterior surfaces. If the building exceed three stories in height, such skylight shall have at least six inches over same a strong wire netting (wire not lighter than No. 8 and mesh not coarser than 1½x1½ inches), unless the glass contains a wire netting within itself.

Sec. 284. (Loads.—Allowance for Live Loads in Construction of Floors of Class III.)—For all buildings of Class III. the floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of forty pounds for every square foot of surface in such floors.

Sec. 285. (Rooms of Class III.—When Considered Habitable.)—In buildings of Class III., no room shall be considered habitable or used as a habitation unless it has at least one window of an area equal to one-tenth of the superficial area of such room opening into the external air.

Sec 286. (Fire Walls.—Thickness Of.—When Dispensed With.)—In buildings of Class III., fire walls of brick not less than twelve inches thick shall be built, extending above the roof thereof, if such roof is flat, and also above the roof of such building where the same abuts against another building, or where the same stands upon any line of any lot, excepting street or alley lines. Provided, that where eight-inch walls are permitted in the top story of buildings, or where the building is not over three stories high, the fire walls may be eight inches thick. Such fire walls, where they stand upon lot lines or where they are over the dividing walls between buildings, or over the dividing walls in the interiors of buildings, where such are required by the provisions of this chapter by reason of the great area of such buildings, shall extend at least two feet above the roof of such buildings. Fire walls upon street and alley lines shall extend not less than eighteen inches above the roofs of such buildings. Fire walls may be dispensed with on street and alley lines, if the tops of the roof boards and roof joists are protected against fire for a distance of at least five feet from such street or alley lines by a coating of mortar or hollow tile or porous tile at least two inches thick. Fire walls at street and alley lines may also be dispenssd with in all cases where the entire framing and material of the roof is made strictly fireproof.

Walls facing upon courts and light shafts shall be treated as in the same category with walls facing upon streets and alleys.

Fire walls shall be covered with a weatherproof coping of incombustible material.

Sec. 287. (Bay Windows and Light Shafts.—Material For.)—Bay or oriel windows and light shafts may be built of combustible material in buildings of Class III. of two stories or less in height, provided, such bay and oriel windows or light shafts shall not have a greater width than twelve feet at wall line of building, and, provided, that the outside walls, roofs and soffits of such bay or oriel windows and light shafts, when so constructed, shall be covered with sheet metal or other incombustible material. In all other cases, bay and oriel windows and light shafts and their supports shall be constructed entirely of incombustible material.

Sec. 288. (Walls.—Brick Wall Upon Wooden Sills.—Level of Sills Allowed.)—All buildings of Class III. not exceeding one story in height and twenty feet in height from top of sills to highest point of roof, and with side walls not exceeding fourteen feet in height, and with floor area not exceeding one thousand two hundred square feet, may have brick walls not less than eight inches in thickness erected on wooden sills, the sills supported on iron, masonry or concrete supports extending four feet below the surface of the ground. The foundations under such supports shall be of concrete, stone or brick, each covering not less than five square feet area and not more than eight feet apart to support the weight that may rest upon them with safety; sills shall be placed not higher than four feet above the established grade of the street upon which the lot fronts, and upon which lot the building is erected, where grades are established, and not exceeding seven feet above the ground where grades are not established. In all cases of buildings being more than one story and

less than two stories high, and having a gable or hip roof of not less than one-third (1-3) pitch, 8-inch walls on solid brick or stone masonry may be used, provided they do not exceed 14 feet in height measured from the first floor joist, and provided such buildings have a floor area not exceeding one thousand two hundred (1,200) feet, and are not over twenty-two feet in width.

Roofs.—Strength Of. See Section 610.
Roofs.—Shingle and Gravel. See Section 609.
Wind Pressure. Precautions against. See Section 603.
Walls.—Reinforced Concrete. See Section 554.
Walls.—Ledges. See Section 588.
Towers, Domes and Spires. See Section 613.
Limitations in Changing Class of Buildings. See Section 633.

ARTICLE VII.

PROVISIONS RELATING SOLELY TO CLASS IV.

In Class IV. shall be included every building used as an assembly hall, whether such hall is used for the purpose of worship, instruction or entertainment, unless such building is used for any of the purposes for which buildings of Class V. or Class VIII. are used.

Sec. 289. **(Walls.—Outside Walls of Class IV.—Structures Built Above.—Walls Of.)**—The outside walls of every building used wholly or in part for the purposes of Class IV., the roof or ceiling of which is carried on trusses or girders of a span of fifty feet or more, shall be as follows:

If such walls are less than twenty-five feet high, not less than twenty inches thick.

If they are more than twenty-five feet high and less than forty-five feet high, they shall not be less than twenty-four inches thick.

If they are more than forty-five feet and less than sixty feet high, they shall not be less than twenty-eight inches thick.

If they are more than sixty feet and less than seventy-five feet high, they shall not be less than thirty-two inches thick.

If they are more than seventy-five feet and less than ninety feet high, they shall not be less than thirty-six inches thick.

An increase of four inches in thickness of such walls shall be made in all cases where they are over one hundred feet long without cross walls of equal height.

Walls around stairs, elevators and shafts. See section 588.

For rooms used for the purposes of Class IV., where such rooms are less than fifty feet wide in the clear, the thickness of the walls enclosing or surrounding such rooms may be reduced by four inches.

The outside walls of every building of Class IV., the roof or ceiling of which is not carried on trusses or girders, shall be of the same thickness as in buildings of Class I.

If one or more stories are built above the room or rooms, or portion of any such building devoted to the uses of Class IV., and such stories are carried on trusses or girders, the thickness of walls shall be increased by four inches for each two stories or part thereof above every such room.

If solid masonry buttresses are employed, and placed eighteen feet or less apart, and extended to the foot of the trusses or girders carrying the ceiling, or if iron or steel pillars are inserted in such walls for the support of the superstructure, and at distances not more than twenty-four feet between centers, and if such pillars extend to and carry the superimposed trusses and girders, the thickness of such walls may be reduced in proportion to the increase of strength afforded by such buttresses or pillars; but in no case shall any such wall be less than twelve inches thick in the top story; four inches shall be added, going downward, for each story, or for each twenty-five feet in height of wall. Provided, that if in any building of this class now in existence the structural parts thereof do not comply with the foregoing requirements, and structural changes are made therein, then all walls, columns or other structural parts shall be strengthened in a manner satisfactory to the Commissioner of Buildings.

Sec. 290. **(Walls.—Columns In ;)**—If iron or steel columns are introduced in such walls, the brickwork around the same shall be bonded into that of the connecting walls, and each of such columns shall be fireproofed, as provided in Section 511 of this chapter.

Sec. 291. **(Frontage of Class IV. Seating Less Than 800.)**—Buildings of Class IV., containing halls or rooms of an aggregate seating capacity of eight hundred persons or less, shall have for each hall or room a frontage upon two public spaces, of which at least one shall be a street, and of which the other, if it is not a street, shall be a public or private alley, not less than ten feet wide, opening directly on a public street.

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Sec. 292. **(Frontage of Class IV.—Seating Over 800.)**—Buildings of Class IV., containing halls or rooms used for the purposes of Class IV. of greater aggregate seating capacity than eight hundred, shall have for each such hall or room a frontage upon three open spaces, of which at least one shall be a public street, while the two others, if not streets, shall be public or private alleys of a width of not less than ten feet each, opening directly on a public street, or fireproof passageways or tunnels of not less than seven feet each in width may be used in place of these alleys, provided, such passageways or tunnels lead to a public thoroughfare.

Sec. 293. **(Buildings, Class IV.—Construction Of.)**—Amended Dec. 11, 1905, to read as follows:

Buildings of Class IV., containing halls of an aggregate seating capacity of not more than eight hundred, may be built of ordinary construction. If such halls have a greater aggregate seating capacity than eight hundred (800) and less than one thousand five hundred (1,500), such building shall be built of mill, slow-burning, or fireproof construction. If such hall have an aggregate seating capacity of one thousand five hundred (1,500) or more, such buildings shall be built entirely of fireproof construction, provided that buildings mainly used for exposition or exhibition purposes, and not exceeding two stories in height, or having for public use only a main floor and one gallery, and which have their outside walls and structural members of incombustible material and which comply in all other respects with this ordinance, may have their temporary seats, boxes, showcases, platforms, or booths, constructed of combustible material.

In computing the seating capacity of any room or building used for the purposes of Class IV., in which the seats are not fixed, an allowance of eight square feet of floor area shall be made for each person, and all space between the walls or partitions of such room or building shall be measured in this computation. *Provided, that in church buildings not having more than two stories and each floor having its own separate exits and standing free from all buildings, the seating capacity of each floor shall be estimated alone as determining the kind of construction under this article.*

Distance of said building from any other structure or building, to be at least seven feet on all sides.

As amended February 4, 1907.

Sec. 294. **(Buildings of Class IV., Used Partly for Other Purposes.)**—Any building occupied wholly or in part for the purposes of Class IV., shall be built entirely of fireproof construction, if the halls or rooms used for the purposes of Class IV. therein have an aggregate seating capacity greater than one thousand five hundred

Sec. 295. **(Buildings of Certain Height.—Construction Of.)**—Any building higher than sixty feet and connected with or made part of any building used wholly or in part for the purposes of Class IV., shall be entirely of fireproof construction. Any such building less than sixty feet in height shall, if its case is not already covered by other provisions of this chapter, be made of fireproof, slow-burning or mill construction.

Sec. 296. **(Opening Between Non-Fireproof Buildings.)**—In all cases where fireproof construction is not used for the whole of two or more connected buildings, used wholly or in part for the purposes of Class IV., there shall be at each connecting opening double iron doors.

Sec. 297. **(Spires, Cupolas and Domes Upon Houses of Worship.—Violation.—Spires, etc., to be Taken Down.—Roofs of Isolated Buildings of Class IV.)**—Spires, cupolas or domes with a framework of non-fireproof material and covered on the outside with incombustible material, may be erected as part of any house of public worship, and if such house of worship is so built that it is nowhere nearer than twenty feet to any line of the lot upon which it stands (street and alley lines excepted), such non-fireproof spires, cupolas or domes may be maintained only while this intervening space of twenty feet is maintained unoccupied as part of the grounds or premises belonging to such house of public worship. If the conditions of such building be so changed that there shall not be a vacant space as hereinbefore required surrounding same, such spire, cupola or dome shall be forthwith taken down.

The roofs of isolated buildings, occupied for purposes of Class IV., shall be constructed in the same manner as that provided for spires, domes and cupolas.

Provided, however, that the roofs of houses of worship outside the fire limits not exceeding twenty-eight hundred square feet in area may be covered with shingles.

Sec. 298. **(Floor Levels.—Limitation of Floor Levels of Class IV.—Auditorium Floor of Class IV.—Height Above Sidewalk.—Stairs.)**—The following limitations of floor levels in buildings occupied either wholly or in part for purposes of Class IV. shall be observed in all cases.

In buildings occupied either wholly or in part for purposes of Class IV., no auditorium of a greater seating capacity than one thousand shall have the highest part of its main floor at a greater distance than ten feet above the adjacent sidewalk

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grades. No room or rooms used for the purposes of Class IV., of greater seating capacity than five hundred, shall be at a greater distance above the sidewalk grade than thirty feet. No room or rooms used for the purpose of Class IV., of greater seating capacity than two hundred, shall be at a higher level above the sidewalk grade than forty-five feet.

Provided, however, that in the case of a building used either wholly or in part for the purposes of Class IV., and built wholly of fireproof construction, a room or rooms to be used for the purposes of Class IV., and of an aggregate seating capacity of less than five hundred, may be located in any story thereof, but in such case there shall be at least two separate and distinct flights of stairs from the floor or floors in which such room or rooms are located to the ground, each of which stairs shall be not less than four feet wide in the clear.

Sec. 299. **(Loads, Allowance for Live Loads in Construction of Floors of Class IV.—Stairways.—Entrances and Exits, Width Of.)**—All floors of all buildings of Class IV. shall be designed and constructed in such a manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floor. The width of stairways in buildings used wholly or in part for the purposes of Class IV. shall be eighteen inches for every one hundred of the aggregate seating capacity of all rooms in such building, which are used for the purposes of Class IV., and for fractional parts of each one hundred seating capacity a proportionate part of eighteen inches shall be added to the width of such stairways, but no stairway in such building shall be less than four feet wide in the clear, except as hereinafter provided; and provided, further, that in any such building having a room or rooms used for purposes of Class IV., the aggregate seating capacity of which shall not exceed two hundred and fifty persons, two separate and distinct three-foot stairways shall be permitted.

All stairways shall have hand railings on each side thereof. Stairways which are over 7 feet wide shall have double intermediate handrails, with end newel posts at least 5½ feet high. No stairways shall ascend a greater height than thirteen feet six inches without a level landing, which, if its width is in the direction of the run of the stairs, shall not be less than three feet wide, or which, if at a turn of the stairs, shall not be of less width than the width of the stairs.

Stairways leading to a box or boxes, seating not to exceed thirty people in the aggregate, shall be independent of all other stairs or seats and not less than two feet six inches wide in the clear. For each additional twenty-five of seating capacity, or major portion thereof, in such boxes, an additional width of five inches shall be added to such stairways.

(Walls.—Ledges.)—See Section 588.

(Doors and Windows.—When Required to Be Closed.—Fire-Resisting Glass.)—See Section 632.

Sec. 300. **(Balconies and Galleries.—Exit and Entrance.)**—Distinct and separate places of exit and entrance shall be provided for each gallery. A common place of exit and entrance may serve for the main floor of the auditorium and the balcony, provided its capacity be equal to the aggregate capacity of all aisles or corridors leading from the main floor and such balcony to such place of exit and entrance.

Sec. 301. **(Balconies and Galleries.—Designation Of.)**—Where there are balconies or galleries, the first balcony or gallery shall be designated the "Balcony," and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery." Such designation shall be plainly printed on all admission tickets.

Sec. 302. **(Aisles.—Steps in Aisles.—Passageways.—Kept Unobstructed.—Width of Corridors, Passages, Hallways and Doors.)**—Aisles in rooms or auditoriums used for the purposes of Class IV. shall in the aggregate be eighteen inches in width for each one hundred of the seating capacity of such room or auditorium, and for fractional parts of one hundred, a proportionate part of eighteen inches shall be added; but no aisle shall be less than two feet and six inches in width in its narrowest part.

Steps shall be permitted in aisles only as extending from bank to bank of seats, and whenever the rise from bank to bank of seats is less than five inches the floor of the aisles shall be made as an inclined plane, and where steps occur in outside aisles or corridors, they shall not be isolated, but shall be grouped together and there shall be a light so placed as to illuminate such steps in such outside aisles or corridors. All aisles and passageway in such rooms or auditoriums shall be kept free from camp stools, sofas, chairs and other obstructions, and no person shall be allowed to stand in or occupy any of such aisles or passageways during any performance, service, exhibition, lecture, concert, ball, or any public assembly.

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Sec. 303. **(Corridors, Passageways, Hallways and Doors.—Width of.)**—The Width of corridors, passageways, hallways and doors adjacent to, connected with or a part of such rooms or auditoriums, shall be computed in the same manner as is herein provided for stairways and aisles, excepting, however, that no such corridor, passageway or hallway shall be anywhere less than four feet in width, and no such door shall be less than three feet in width.

Sec. 304. **(Seats.—Number of in Rows.)**—There shall not be more than fourteen seats in any one row between aisles.

Rows of seats shall not be less than 2 feet 8 inches from back to back, and no bank of seats shall be of greater rise than 24 inches.

Sec. 305. **(Emergency Exits.)**—Emergency exits and stairways shall be provided outside of the walls of all assembly halls of a larger seating capacity than eight hundred. Provided, however, that if any such assembly hall is used for any of the purposes described in Section 311 of this chapter, and has a seating capacity of more than four hundred, such assembly hall shall have emergency exits to the street of one-half the aggregate width of the main exits, but no such emergency exit shall be less than three feet in width.

Such emergency exits and stairways therefrom may be built inside the walls of the building in a corridor or passageway not less than seven feet wide, which corridor or passageway shall be surrounded by a fireproof partition, not less than four inches thick.

Such stairways shall be made of wrought iron or steel, or other approved fireproof material and cast iron is not approved for this work. All emergency exits and stairways therefrom shall be kept free from obstruction of any kind, including snow and ice.

Sec. 306. **(Doors to Open Outward.)**—All doors affording access directly or indirectly to the street from any room used for the purposes of Class IV. shall open outward upon suitable hinges.

Exit doors from such rooms shall not be obscured by draperies and shall not be locked, or fastened, in any manner during the entire time any such room is open to the public, but shall be so constructed and maintained that they may be easily opened from the interior.

Sec. 307. **(Walls Between Auditorium and Stage.)**—In buildings used either wholly or in part for the purposes of Class IV. hereafter erected, there shall be a solid brick wall, of the same thickness as that called for on the outside walls, between the auditorium and stage; and in non-fireproof buildings such walls shall extend to a height of three feet above the roof. Provided, however, that in existing buildings, any room used for the purposes of Class IV., and having a seating capacity greater than four hundred, shall have the proscenium wall built of incombustible material.

Sec. 308. **(Curtain Shall Be Iron, Steel or Asbestos.—Inspection Of.—Fee.)**—The main curtain opening in any such room shall have a wrought iron or steel or asbestos curtain, which shall be inspected by the building department semi-annually, for which inspection a charge of two dollars shall be made, and all other openings in the proscenium wall shall have self-closing iron doors.

Sec. 309. **(Structures Over Ceiling.—Construction.)**—If any structure is built over the ceiling or roof of any building used either wholly or in part for the purposes of Class IV., the different members of the girders or trusses supporting same shall have their fireproofing double, in the manner required for columns for fireproof buildings of Class I.

Sec. 310. **(Fire Apparatus on Stage.)**—In all rooms used for the purpose of Class IV. of a seating capacity of two hundred and fifty or more, where stationary scenery is used, there shall be kept for use two or more portable fire extinguishers or hand fire pumps on and under the stage, and also four fire department axes, two fifteen-foot hooks and two ten-foot hooks on each tier or floor of the stage, subject to the approval of the Fire Marshal, and in such rooms of less seating capacity than two hundred and fifty, there shall be at least one portable fire extinguisher.

Sec. 311. **(Rooms Used for Regular Theatrical or Vaudeville Performances.—Exit Doors.—Fireman.—Employment of.—Duties.)**—Amended by ordinance June 8, 1908, to read as follows:

Exit doors shall not be obscured by draperies and shall not be locked or fastened in any manner during the entire time any such room of Class IV is open to the public, so as to prevent them from being easily opened outwardly; and such doors shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

It shall be the duty of every person, firm or corporation conducting, operating or maintaining any room having a seating capacity of three hundred or more, used for the purposes of Class IV and which is used regularly for theatrical or vaudeville performances,

and where an admission fee is charged, to procure at his, their or its own expense the attendance at each and every performance of one fireman who shall be detailed by the Fire Marshal from the regular City Fire Department; he shall be in the uniform of the Chicago Fire Department and he shall be on duty at such place wherein such theatrical or vaudeville performance is given during the entire time it is open to the public. He shall report to and be subject to the orders of the Fire Marshal and shall see that all fire apparatus required by this Chapter is in its proper condition, ready for use, and that all exit doors are unlocked during the entire time such building is open to the public, and are all in efficient and ready working order.

Such fireman and the Fire Marshal shall require all persons employed in or about such room to be drilled in the use of all apparatus and appliances for the prevention of fire installed therein, at least twice in every week, and such fireman shall report to the Fire Marshal the manner and efficiency of such drill. Such fireman shall report in writing daily to the Fire Marshal the condition and equipment of the building, or portion thereof, to which he is detailed. No fireman shall be on duty at any one building for a longer period than two weeks.

The compensation to be paid to the city for the services of such city fireman so detailed shall be based on the regular salary paid by the city to such fireman and shall be computed according to the ratio between the number of hours such fireman is required by his duties hereunder to devote to such theater and the total number of hours such fireman is employed by the city for all purposes. All sums received by the city under the provisions of this section shall be for the use and benefit of the Fire Department.

Sec. 312. (Standpipe and Hose on Stage.)—A standpipe not less than one and one-half inches in diameter, with a hose connection and hose valve therein, shall be installed on each side of the stage in such room, and shall at all times have a hose connected thereto, ready for use.

Such standpipe shall be connected with a power pump or gravity tank so that a sufficient pressure of water shall be furnished through such standpipe to afford adequate fire protection. The pressure to be furnished by such tank or pump shall be satisfactory to the Fire Marshal.

Sec. 313. (Vents or Flue Pipes.)—One or more vents or flue pipes of metal construction or other incombustible material approved by the commissioner of buildings shall be built over the stage, and shall extend not less than ten feet above the highest point of the roof, and shall be equivalent in area to one-twentieth of the area of the stage.

In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls, and shall be continued and run up on the exterior of the building to a point five feet above the highest point of the additional stories.

All such flues or vents shall be provided with metal dampers, and shall be opened by a closed circuit battery, approved by the City Electrician.

Such dampers shall be controlled by two switches, one at the Electrician's station on the stage, which station shall be fireproof, and the other at the city fireman's station on the opposite side of the stage; such switches shall be located in such places on the stage as may be designated by the Fire Marshal, and each switch shall have a sign with plain directions as to the operation of same printed thereon.

Sec. 314. (Fuse Boxes.)—All fuse boxes shall be surrounded by two thicknesses of fireproof material, with an air space between, and no fuse shall be exposed to the air between the switchboards; all electrical equipment in such rooms shall be installed and maintained to the satisfaction and approval of the City Electrician.

Sec. 315. (License.)—The amusement license for each room used for the purposes of Class IV. shall state the number of persons such room has accommodations for, which number shall be governed by the provisions of this chapter relating thereto, and no more than that number shall be allowed to be in such room at any one time.

No amusement license shall be issued for any room used for the purposes of Class IV. unless the Commissioner of Buildings, the Fire Marshal and the City Electrician shall first have certified, in writing, that such room complies with the provisions of this chapter in every respect.

Sec. 316. (Exits.—Diagram of, Printed on Programs.—Signs Over.)—It shall be the duty of the owner, lessee, or manager of every room used for the purposes of Class IV., and in which programs are issued for performances given therein, to cause to be printed on such programs a diagram showing conspicuously the exits from such room. The word "Exit" shall be in letters at least six inches high over the opening to every means of egress from any such room, and in any such room having a greater seating capacity than four hundred, a red light furnished by gas or sperm

oil shall be kept burning over such word during the entire period such room is open to the public and until the audience has left such room.

Sec. 317. **(All Parts of Room Well Lighted During Performance.)**—Every portion of any room used for the purposes of Class IV. and all outlets therefrom leading to the streets, including the passageways, courts and corridors, stairways, exits and emergency exit stairways, shall be well and properly lighted during every performance, and the same shall be kept so lighted until the entire audience has left the premises; and every passageway, or court, or corridor, or stairway, or exit, or emergency exit stairway, shall be provided with signs, indicating the way out of the building, the letters of which shall not be less than six inches in height.

Sec. 318. **(Lights in Halls, Corridors and Lobbies, Control of.—Separate Shut-Off.—Connection with Gas Mains.—Protection of Suspended and Bracket Lights.—Protection of Lights Inserted in Walls.—Protection of Foot Lights.—Construction of Border Lights.—Ducts and Shafts Conducting Heated Air from Lights.—Protection of Stage Lights.)**—All gas or electric lights in the halls, passageways, corridors, lobby or other means of ingress to or egress from any such room shall be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place Gas mains supplying any such room shall have independent connections for the auditorium and stage, and provision shall be made for shutting off the gas from the outside of the building. All suspended or bracket lights surrounded by glass, in the auditorium, or in any part of any such room, shall be provided with proper wire netting underneath. No gas or electric light shall be inserted in the walls, woodwork, ceilings, or in any part of any such room, unless protected by fireproof materials. The footlights, if gas light, in addition to the wire network, shall be protected by a strong wire guard, not less than two feet distant from such footlights, and the trough containing such footlights shall be formed of, and be surrounded by, fireproof materials. All border lights shall be constructed according to the best known methods, subject to the approval of the City Electrician, and shall be suspended by wire rope. All ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal, and made double, with an air space between. All stage lights, if gas, shall have strong metal wire guards or screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flame, and such guards or screens shall be firmly soldered to the fixtures in all cases.

The use of calcium lights in any hall or room used regularly for theatrical or vaudeville performances is prohibited, and no calcium lights shall be permitted upon any stage; all arc lights used on the stage shall be subject to the approval of the City Electrician.

318a. It is hereby made the duty of all owners, occupants or lessees of theaters or places of amusement to provide separate dressing room or rooms for males and females in all theaters and places of amusement where dressing room or rooms are provided underneath, adjacent to or above the stage, or elsewhere in the building wherein said theater or place of amusement is located or maintained. The partitions forming said dressing room or rooms, except where already built, shall be constructed with incombustible material.

It shall be unlawful for any person, firm or corporation, whether owner, occupant or lessee of any theater or place of amusement, to permit the joint use by both males and females of any dressing room either underneath, adjacent to or above the stage, or elsewhere in the building wherein any theater or place of amusement is located or maintained.

Passed March 22, 1909.

Sec. 319. **(Apparatus Under Control of Fire Marshal.)**—The standpipes, hose, and all apparatus for the extinguishing of fire or guarding against the same, required by the provisions of this Chapter to be provided, shall be at all times so provided and kept in a manner satisfactory to the Fire Marshal.

Sec. 320. **(Scenery to Be Incombustible.)**—No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of class IV., unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

Two sets of such scenery may be used in existing buildings of this class having a seating capacity of less than 800, and the main floor of which is not more than three (3) feet above the street level of the street upon which such building opens.

Two sets of such scenery may also be allowed in existing buildings of this class having a seating capacity of over 800 and not over 1,200, and the main floor of which is not more than three feet above the street level of the street upon which such building opens; pro-

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vided, that the main curtain opening in any such room shall have a wrought iron or steel curtain which shall be inspected by the Building Department semi-annually, for which inspection a charge of two dollars shall be made.

As amended by ordinance Feb. 10, 1908.

Sec. 321. **(Commissioner of Buildings, City Electrician, Fire Marshal and Superintendent of Police Empowered to Enter.)**—The Commissioner of Buildings, City Electrician, Fire Marshal, Superintendent of Police, and their respective assistants, shall have the right to enter any building used wholly or in part for the purposes of Class IV. and any and all parts thereof, at any reasonable time, and at any time when occupied by the public, in order to examine such building, and it shall be unlawful for any person to interfere with them in the performance of their duties.

Sec. 322. **(Power of Officers to Close.)**—The Commissioner of Buildings, Fire Marshal, City Electrician or Superintendent of Police, or any one of them, shall have the power, and it shall be their joint and several duty, to order any building used wholly or in part for the purposes of Class IV. closed, where it is discovered that there is any violation of any of the provisions of this article, until the same are complied with.

Sec. 323. **(License.—Mayor Shall Revoke.)**—Upon the report to the Mayor by the Commissioner of Buildings, Fire Marshal, City Electrician, or Superintendent of Police, or any of them, that any order or requirement of this article in regard to buildings used wholly or in part for the purposes of Class IV. has been violated or is not being complied with, in any such building, the Mayor shall revoke the amusement license of any amusement or entertainment therein conducted, and shall cause such building, or portion thereof, devoted to the uses of Class IV., to be closed.

ARTICLE VIII.

PROVISIONS RELATING SOLELY TO CLASS V.

Buildings of Class V. Now in Existence.

In Class V. shall be included every building which is used as a public theatre where an admission fee is charged and in which movable scenery is used; provided, however, that public halls and club halls, with a seating capacity of less than six hundred, although occasionally used for theatrical representations, shall not be construed to be public theatres within the meaning of the term as used in this section, notwithstanding the fact that movable scenery is used upon the stage thereof on such occasions, and such public halls and club halls shall not be considered as buildings of Class V. as herein defined. Such public halls and club halls shall be included in Class IV., as defined in Section 400 of this ordinance.

Sec. 324. The following provisions shall apply to buildings now in existence and used wholly or in part for the purposes of Class V.

Sec. 325. **(Walls.—Outside.—Structures Built Above.)**—The outside walls of all such buildings, the roofs or ceilings of which are carried on trusses or girders of a span of fifty feet or more, shall be as follows:

If such walls are less than twenty-five feet high, they shall be not less than twenty inches thick.

If they are more than twenty-five feet and less than forty-five feet high, they shall be not less than twenty-four inches thick.

If they are more than forty-five feet and less than sixty feet high, they shall be not less than twenty-eight inches thick.

If they are more than sixty feet and less than seventy-five feet high, they shall be not less than thirty-two inches thick.

If they are more than seventy-five feet and less than ninety feet high, they shall be not less than thirty-six inches thick.

An increase of four inches in thickness of such walls shall be made in all cases where they are over one hundred feet long, without cross-walls of equal height.

The thickness of the walls enclosing or surrounding rooms used for the purposes of Class V., where such rooms are less than fifty feet wide, may be reduced by four inches.

If one or more stories are built above any room devoted to the uses of Class V., and such stories are carried on trusses or girders, the thickness of walls shall be increased by four inches for each two stories or part thereof above such room.

If solid masonry buttresses are employed and placed eighteen feet or less apart, and extended to the foot of the trusses or girders carrying the ceiling, or if iron or steel columns are inserted in such walls for the support of the superstructure, and at a distance not more than twenty-four feet between centers, and if such columns extend to and carry the superimposed trusses and girders, the thickness of such walls may be reduced in proportion to the increase of strength afforded by such buttresses or columns, but in no case shall any such wall be less than twelve inches thick in

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the top story, and four inches shall be added, going downward, for each story, for each gallery, or for each twenty-five feet in height of wall. Provided, that if in any such building now in existence the structural parts thereof do not comply with the foregoing requirements and structural changes are made therein, then all walls, columns or other structural parts shall be strengthened in a manner satisfactory to the Commissioner of Buildings.

Sec. 326. **(Columns in Walls.—Alterations.)**—Amended by ordinance Dec. 2, 1907, to read as follows:

If iron or steel columns are introduced in such walls, the brick work around the same shall be bonded into that of the connecting walls, and each of such columns shall be fireproofed, as provided in Section 511 *of this Chapter. All alterations in such existing buildings intended to make them comply with the requirements of this chapter may be executed with the same kind of materials as those originally used in the construction of such buildings; provided, that after the said building is brought into compliance with the provisions of this chapter, then, all subsequent alterations, enlargements, repairs, replaced or strengthened structural parts damaged by fire, wear and tear, or otherwise, shall be made of fireproof construction, iron or steel construction, covered with fireproof materials, as provided by Article XII of this chapter.*

Sec. 327. **(Other Classes Built in Conjunction with Class V.—Doors for Openings Between Connecting Buildings.)**—In all cases where existing buildings used wholly or in part for the purposes of Class V. are built in conjunction with or as part of buildings devoted to the uses of other classes, and where such buildings of the other classes, as specified in this chapter, are not built entirely of fireproof construction, double iron doors shall be placed at each connecting opening between such buildings of Class V., and the building connected therewith.

Sec. 328. **(Floor Levels.—Limitations of.)**—The audience room or rooms or auditorium or auditoriums used for the purposes of Class V., containing in the aggregate not more than five hundred seats, if in a fireproof building, may be located in any story thereof, but in such case there shall be at least two separate stairways from the floor or floors in which such audience room or auditorium is located to the ground, each of which stairways shall be not less than four feet in width in the clear.

In existing buildings of fireproof construction, having an audience room or an auditorium with a seating capacity of more than five hundred and less than fifteen hundred, the lowest bank of seats of the main floor thereof shall be not more than twelve feet above the street level, and every such building shall in all other respects conform to the requirements of this chapter. The main floor of no existing theatre of any construction other than fireproof shall be raised above its present elevation.

Sec. 329. **(Loads.—Allowance for Live Loads in Construction of Floors of Class V.)**—For all buildings of Class V., all floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floors.

Sec. 330. **(Stairways.—Entrance and Exits.)**—Stairways affording ingress to or egress from any room or rooms used for the purposes of Class V. shall be in width equivalent to twenty inches for every one hundred of seating capacity of such room and for fractional parts of one hundred a proportionate part of twenty inches of width shall be added, but in no event shall any such stairway be less than four feet wide in the clear, except as hereinafter provided in this section.

All such stairways shall have hand railings on each side thereof and shall not ascend a greater height than thirteen feet six inches without a level landing, and the length and width of such landing shall not be less than the width of the stairs; no run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms. Stairways which are over 7 feet wide shall have double intermediate handrails, with end newel posts at least 5½ feet high.

Steps shall not have a greater rise than seven and three-eighths inches, treads shall not be narrower than eleven inches, and winders shall not be used on any staircase, except where circular staircases are expressly permitted.

In existing theaters each and every balcony and gallery shall have separate and distinct entrance stairways from the sidewalk level, except that in cases where the vestibule or entrance to any such theater is not more than fifteen inches, or two steps, above the sidewalk level and such steps are at or near the building line, the stairways to such balcony and gallery may ascend from the floor of such vestibule or entrance, but if the run of the stairs at the bottom is not toward the street, there shall be a hand rail or rails three feet above the floor constructed from the foot of such stairways for a distance of not less than five feet leading toward the street. All doors intervening between such stairways and the street shall, during each and every performance, be kept unfastened.

There shall be an iron stairway or stairways from the stage to the fly galleries and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Such stairways may be circular. Such circular stairways, however, shall not be used for access to the dressing rooms.

Stairs leading to a box or boxes seating not to exceed thirty people, in the aggregate, shall be independent of all other stairs and seats and not less than two feet eight inches wide in the clear. For each additional twenty-five of seating capacity, or major portion thereof, there shall be an additional width of five inches added to such stairways.

All stairways on the stage side of the proscenium wall shall be not less than two feet six inches wide.

Instead of increasing the width required for entrances, aisles, exits and stairways to that required by this chapter, the owner, lessee or manager of any such theater shall have the privilege of reducing the number of permanent seats therein until the same ratio between such width and number of seats as hereinbefore provided for shall be established, and if such privilege be taken advantage of, it shall be the duty of the Commissioner of Buildings to make inspection and certify that such ratio actually exists before a license for the operation of any such theater shall be issued.

Sec. 331. **(Floors at Exits.)**—Floors at all exits shall be so designed as to be level and flush with adjacent floors and shall extend for an unbroken width of not less than four feet in front of each exit, and shall be two feet wider than such exit.

Sec. 332. **(Seats in Rows Between Aisles.)**—More than ten seats in any row between aisles in any gallery shall not be permitted. On the main floor and balcony, not more than eleven seats between aisles shall be permitted; provided, however, that in banks of seats on main floors and balconies that are not at a greater distance than twenty feet from an exit, thirteen seats shall be permitted between aisles.

Seats shall be not less than twenty inches in width, measured at the top of the seat backs.

Rows of seats shall be not less than two feet eight inches from back to back.

No bank of seats shall be of greater rise than twenty-two inches.

All groups of seats shall be so arranged that there shall be an aisle at each side of each group, provided, however, that groups of five seats or less may abut upon a tunnel at one side and an aisle at the other side.

The number of banks of seats on the main floor shall not exceed fifteen, unless an intervening or cross aisle is provided between each fifteen banks of seats or a direct exit is provided for each aisle.

The number of banks of seats in the balcony shall not exceed nine unless an intervening or cross aisle is provided between each nine banks of seats or a direct exit is provided for each aisle.

Sec. 333. **(Tunnels.—Cross Aisles.—Vertical Rise.—Foyer.)**—There shall be no more than twelve feet rise, measured vertically, in any aisle in any gallery without a direct exit by tunnel or otherwise to a corridor with free opening on to the gallery stairs or other direct discharge to the street, or at such elevation of twelve feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than three feet wide in the clear. No foyer shall be open to the theatre proper except through the exits.

Sec. 334. **(Main Floor.—Balcony and Gallery.—Designation of.)**—The lower floor of all theaters shall be designated the "Main Floor."

Where there are balconies or galleries, the first balcony or gallery shall be designated the "Balcony" and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery." Such designation shall be printed plainly on all admission tickets.

Sec. 335. **(Aisles, Corridors and Passageways.—Kept Unobstructed.—Steps in Aisles.)**—The minimum width of aisles with diverging sides in any room or auditorium used for the purposes of Class V. shall be two feet eight inches at the end near the stage and not less than three feet at the other end.

The minimum width of aisles with parallel sides shall be three feet.

Every aisle shall lead as nearly as possible directly to an exit, but in no case shall the center line of such exit be more than three feet from the center line of any such aisle leading thereto. Steps shall not be permitted in aisles except as extending from bank to bank of seats and no riser shall be greater than seven and three-eighths inches, and no tread shall be less than nine and one-half inches, and whenever the rise from bank to bank of seats is less than five inches, the floor of the aisles shall be made as an inclined plane, and where steps are placed in outside aisles or corridors they shall not be isolated, but shall be grouped together and a light shall be maintained so that every place where there are steps in inclosing aisles or corridors shall be clearly lighted. All aisles, passageways, corridors and exits shall be

kept free from camp stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any such aisles, passageways, corridors or exits during any performance, service, exhibition, lecture, concert or any public assemblage.

Sec. 336. **(Corridors, Passageways, Hallways and Doors.—Width Of.)**—The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, excepting, however, that no corridor shall be anywhere less than four feet in width, and no door less than three feet wide, except as otherwise herein provided.

All corridors, passageways, hallways and stairways leading from any balcony or gallery to any toilet room, retiring room, smoking room, check room or private office, shall permit of free passage, without returning to an outer exit of the building. Such corridors, passageways, hallways and stairways shall be at least three feet in width in every part between such balcony or gallery and such outer exit, and shall be unobstructed in every part except by doors, not less than three feet in width in the clear, which shall swing outward and which shall not be provided with locks or catches of any kind whatever.

Sec. 337. **(Doors.—Entrance.)**—The entrance doors to every theater shall be of sufficient width to accommodate the entire audience, computed on the basis of twenty inches in width in the clear to each hundred permanent seats, and in addition thereto a proportionate part of twenty inches for a fractional part of each one hundred seats in the audience room or auditorium.

No mirrors shall be so arranged as to give the appearance of a doorway, exit, hallway or corridor, when no such doorway, exit, hallway or corridor is really in existence, nor shall there be any false doors or windows giving the appearance of an opening where none really exists.

Walls.—Ledges.—See Section 588.

Doors and Windows.—When Required to be Closed.—Fire-resisting Glass.—See Section 632.

Sec. 338. **(Emergency Exits.—Width.—Emergency Stairs. — Width. — Emergency Exits Inside Walls of Buildings.—Fire Escapes, Construction.—Fire Escapes Leading to Street or Alley.—Doors Open Outward.)**—Emergency exits and stairways shall be provided separately for each floor, balcony and gallery. They shall be of the same aggregate width as that provided for the main exits, and no emergency exit, doorway or stairway shall be less than three feet in width. Such emergency stairways shall be made of iron, steel or other incombustible materials. Such emergency exits shall be kept free of obstructions of any kind, including snow and ice.

Such emergency exits and stairways may be built inside the walls of the building, provided they are surrounded by a fireproof partition not less than four inches thick separating the exits and stairways from the audience room or auditorium.

If said emergency exits lead outside the building, the opening leading thereto shall have metal frames filled with wire glass doors opening outward, hung from the inside corner of the jambs, and so constructed as not to project, when opened, beyond the outside face of the wall. Outside shutters will not be permitted, except when the same shall open automatically from the interior, without resistance, and when used or opened will automatically fasten, securely, flat against the wall, so as not to in any way obstruct the passage on the outside; all such automatic devices or attachments to said doors to be subject to the approval of the Commissioner of Buildings and the Fire Marshal of the City of Chicago.
As amended October 22, 1906.

Whenever any such emergency stairway passes over an exit door or window or other opening, such stairway shall be completely inclosed for a space of five feet greater in width than such opening by iron, steel or other incombustible material.

All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley and direct and immediate exit to such public thoroughfare shall not be obstructed by any doors, gates, bars or other obstruction of any character.

Every court in which there is an emergency stairway shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley or street, without entering into or passing through or over any building unless by a four-foot wide fireproof passage on the court or ground level.

All doors in openings from any and all exits and stairways shall be so constructed that when opened they shall not obstruct any portion of any other doorway, opening or passageway.

All doors affording ingress to or egress from any theater shall open outward upon suitable hinges.

Sec. 339. **(Exit Doors.—Particulars as to.)**—Exit doors shall not be obscured by draperies and shall not be locked or fastened in any manner during the entire time such theater is open to the public, so as to prevent them from being easily opened

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outwardly; and such door shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

Sec. 340. (Wall.—Brick Proscenium Wall Between Auditorium and Stage.—Steel Curtain Fireproofed on Stage Side.—No Combustible Material on Audience Side.—Plans for Curtain.—Permit from Building Department.—Inspection.—Fee.)—There shall be in every theater a solid brick wall of the same construction and thickness as is required in outside walls between the auditorium and the stage. The main proscenium opening shall have a substantial steel curtain vertically operated and fireproofed on the stage side, which shall be raised and lowered by mechanical power and which shall be in constant use as the regular curtain and act drop.

No combustible material other than painted decorations shall be applied to the audience side of such curtains.

Plans for such curtain shall be approved by the building department and a permit obtained for its erection. The building department shall inspect such curtain semi-annually, for which inspection a fee of two (2) dollars shall be charged.

All other openings in such proscenium wall shall have iron doors, frames and thresholds.

Sec. 341. (Stage, Construction Of.—Fireproof Paint.—Scenery.—How Treated.)—The framing of the floor of every stage shall be of iron or steel. The stage floor may be of wood, but shall not be less than two and three-fourths inches thick. The entire floor construction and floor of fly galleries, rigging lofts and paint gallery, all railings and supports and stanchions thereon, and all sheaves, pulleys and cables and their supports shall be of iron or steel. All woodwork, including the under side of floor boards, and all framing for scenery used on or about the stage shall be coated with a fireproof paint, the qualities of which shall be submitted to and approved by the Commissioner of Buildings. All wood used for floor and floor supports shall be coated on the under side with the same kind of paint.

No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of Class V., unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

Sec. 342. (Vestibule of Stage Doors.)—All doorways or openings in the rear or sides of the stage shall be vestibuled or protected in a manner satisfactory to the Commissioner of Buildings, so as to protect the curtain, scenery and auditorium against draughts of air.

Sec. 343. (Vents, Flue Pipes, Size of.—Dampers.—Switches for Dampers.)—One or more vents or flue pipes, of metal construction, or other incombustible material suitable for carrying away smoke, approved by the Commissioner of Buildings, and extending not less than fifteen feet above the highest point of the roof, and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.

In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls and shall be continued and run up on the exterior of the building to a point five feet above the highest point of such additional stories.

All such flues or vents shall be provided with metal dampers, and shall be opened by a closed circuit battery approved by the city electrician; such dampers shall be controlled by two switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the city fireman's station on the opposite side of the stage; such switches shall be located at such places on the stage as are designated by the fire marshal, and each shall have a sign with plain directions as to the operation of same printed thereon.

All fuse boxes shall be surrounded by two thicknesses of fireproof material, with an air space between, and no fuses shall be exposed to the air between the switchboards.

Sec. 344. (Automatic Sprinklers.—Location Of—Tank.—Connections.)—There shall be provided an approved system of automatic sprinklers, with approved automatic closed circuit electric devices connecting the valves regulating the flow of water in the various sprinkler pipes, with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal shall direct, so arranged as to prevent any tampering with the system or the shutting off of the water from the sprinkler pipes without automatic notice to the fire department.

Such system of automatic sprinklers shall be supplied with water from a tank located not less than twenty feet above the level of the highest sprinkler head in the system, and it shall be the duty of the fireman provided for in this chapter to include in his daily report the result of an inspection to determine the sufficiency of water in this tank. Automatic sprinklers shall be placed in the paint room, store-

room, property room, scene storage room, carpenter shop and dressing rooms, if such rooms are in or connected with a building used for the purposes of Class V., such tank shall not be connected with a standpipe and ladder system, but shall be filled through a separate pipe from a fire pump, and a three-inch iron pipe shall extend from such tank to the outside of such building, with Siamese connections for fire department use. Such entire automatic sprinkler system and equipment and the location thereof shall be subject to the approval of the Fire Marshal.

Sec. 345. **(Fire Apparatus on Stage.—Hand Fire Pumps.—Fire Materials.—Hot Air Furnaces.)**—A standpipe not less than two and one-half inches in diameter, having a hose valve or valves thereon, shall be installed on each side of the stage, with a hose connection at the stage and at each level above and below the stage, and hose connected thereto at each valve ready for use at all times. Such standpipe shall be connected with a tank on the roof containing not less than three thousand gallons of water, protected from frost, and also with a power pump, all of which shall be subject to the approval of the Fire Marshal. Portable fire extinguishers or hand fire pumps shall always be kept ready for use on and under the stage; in fly galleries and in rigging lofts, and in addition thereto at least four fire department axes and six pike poles shall be kept ready for use on each tier or floor of the stage, all of which shall be subject to the approval of the Fire Marshal.

The use of ordinary hot air furnaces or stoves is prohibited.

Sec. 346. **(Exits.—Diagram Of, Printed on Program.)**—It shall be the duty of the owner, lessee or manager of any theater, for any performance in which programs are issued, to cause to be printed on such programs, on the page opposite that upon which the cast is printed, a diagram showing conspicuously all exits of such building. A diagram of seats of each floor, and the exits leading from each floor drawn to a scale of one-eighth inch to the foot, shall be hung in a frame within two feet of the ticket seller's window and so as to be easily seen by the public.

Sec. 347. **(Lighting.—Independent Lighting System for Exits.—Red Light Over Exits.)**—All stairways and corridors shall be supplied with a supplementary lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building and shall be in operation during the entire period such theater is open to the public and until the audience has left the building. The word "EXIT" shall be in letters at least six inches high over the opening to every means of egress from such theater and a red light furnished by gas or sperm oil shall be kept burning over such word "EXIT" at every such opening, during the entire period such theater is open to the public and until the audience has left the building.

Sec. 348. **(Fire Alarm Apparatus.)**—Every theater shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus, connected by the necessary wires with the headquarters of the city fire alarm telegraph, and such other place or places as the Fire Marshal may direct. The number and location of the boxes and the character of the system, whether automatic or manual, or both, shall be determined by the Fire Marshal.

Sec. 349. **(Firemen.—Employment of.—Duties.)**—Amended by ordinance, June 8, 1908, to read as follows:

It shall be the duty of every person, firm or corporation conducting, operating or maintaining a theater to procure at his, their or its own expense, the attendance, at each and every performance, of one fireman who shall be detailed by the Fire Marshal from the regular City Fire Department; he shall be in the uniform of the Chicago Fire Department and he shall be on duty at such theater during the entire time it is open to the public. He shall report to and be subject to the orders of the Fire Marshal and shall see that all fire apparatus required by this Chapter is in its proper condition, ready for use and that all exit doors are unlocked during the entire time such theater is open to the public and are all in efficient and ready working order. During the performance he shall remain on the stage and shall generally perform such duties as may be required of him by the rules and regulations of the Fire Department governing firemen detailed at theaters.

It shall also be the duty of every person, firm or corporation conducting, operating or maintaining a theater to employ in addition to the fireman hereinbefore provided for, one other experienced and competent person as a private watchman or fireman who shall be approved by the Fire Marshal and who shall be in distinctive uniform and shall be on duty at such theater during the entire time it is open to the public. Such private watchman or fireman shall report and be subject to the orders of the Fire Marshal and it shall be his duty to see that the provisions of this Chapter are complied with in all portions of the theater occupied and used by the public, and that all exit doors are unlocked during the entire time such theater is open to the public, and in efficient and ready working order. The city fireman and Fire Marshal shall require a drill of the employes of such theater, including such private watchman or fireman, in the use of all apparatus and appliances

for the prevention of fire inside the building and the saving of life, at least twice in every week, and such city fireman shall report to the Fire Marshal the manner and efficiency of such drill. Such city fireman shall report in writing daily to the Fire Marshal the condition and equipment of the theater to which he is detailed. No city fireman shall be on duty at any one theater for a longer period than two weeks.

The compensation to be paid the city for the services of such city fireman so detailed shall be based on the regular salary paid by the city to such fireman, and shall be computed according to the ratio between the number of hours such fireman is required by his duties hereunder to devote to such theater and the total number of hours such fireman is employed by the city for all purposes. All sums received by the city under the provisions of this section shall be for the use and benefit of the Fire Department.

Sec. 350. **(Amusement License.)**—The amusement license issued for each theater shall state the number of permanent seats the theater contains, which number shall be governed by the provisions of this ordinance relating thereto, and no more than that number of persons shall be permitted to be in such theater at any one time.

No license for the operation of a theater will be issued unless the Commissioner of Buildings, Fire Marshal and the City Electrician shall first have certified, in writing, that such theater complies with the provisions of this chapter in every respect.

Sec. 351. **(Lighting.—All Parts Well Lighted During Performances.)**—Every portion of any theater devoted to the use or accommodation of the public and all outlets therefrom leading to the streets, including all open courts, corridors, stairways, exits and emergency exit stairways, shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises.

Sec. 352. **(Lights.—Control of Lights in Halls, Corridors and Lobbies.—Separate Shut-off.—Connections with Gas Mains.—Independent Connections.—Protection of Suspended and Bracket Lights.—Protection of Lights Inserted in Walls.—Protection of Footlights.—Construction of Border Lights.—Ducts and Shafts Conducting Heated Air from Lights.—Gas Stage Lights to Have Metal Screens.)**—All gas or electric lights in the halls, corridors, lobbies or any part of any theater used by the audience, except the auditorium, shall be controlled by a separate shut-off, located in the lobby, and controlled only in that particular place. Gas mains supplying such theater shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the outside of the building. All suspended or bracket lights surrounded by glass in the auditorium, or in any other part of the theater, shall be provided with proper wire netting underneath. No gas or electric lights shall be inserted in the walls, woodwork, ceilings, or in any part of the theater, unless protected by fireproof materials. In case gas is used the footlights, in addition to the wire network, shall be protected by a strong wire guard not less than two feet distant from such footlights, and the trough containing such footlights shall be formed of and surrounded by fireproof material. All border lights shall be constructed according to the best known method, and subject to the approval of the Fire Marshal and the City Electrician, and shall be suspended by wire rope. All ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between. All gas stage lights shall have strong metal wire guards or screens not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flames of such lights, and such guards or screens shall be soldered to the fixtures in all cases.

The use of calcium lights in any theater is prohibited. All arc lights used on the stage shall at all times be subject to the approval of the city electrician, and no arc lights shall be used on any stage unless approved by said city electrician.

Sec. 353. **(Fire Apparatus.—Under Control of Fire Department.)**—The standpipes, automatic sprinklers, gas pipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtain, switch boxes, ventilators, controlling levers, axes and pike poles, and all apparatus for the extinguishing of fire or guarding against the same, as provided for by this chapter, shall be made and kept at all times in condition satisfactory to and under the control of the Fire Marshal.

Sec. 354. **(Officers Empowered to Enter Buildings.)**—The Commissioner of Buildings, Fire Marshal, City Electrician, Superintendent of Police, or any of them, and their respective assistants, shall have the right to enter any building used wholly or in part for the purposes of Class V., and any and all parts thereof, at any reasonable time, and at any time when occupied by the public, in order to examine such buildings; to judge of the condition of the same and to discharge their respective duties, and it shall be unlawful for any person to interfere with them, or any of them, in the performance of their duties.

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Sec. 355. **(The Commissioner of Buildings, Fire Marshal, City Electrician or Superintendent of Police Shall Close Buildings for Violations.)**—The Commissioner of Buildings, Fire Marshal, City Electrician and the Superintendent of Police, or any one of them, shall have the power and it shall be their joint and several duty, to order any building used wholly or in part for the purposes of Class V., closed, where it is discovered that there is any violation of any of the provisions of this chapter and keep same closed until such provisions are complied with.

Sec. 356. **(License.—Mayor Shall Revoke.)**—Upon a report to the Mayor by the Commissioner of Buildings, Fire Marshal, City Electrician or the Superintendent of Police that any requirement of this chapter, or that any order given by them or any of them in regard thereto has been violated, or not complied with, the Mayor shall revoke the license of any such theater or place of amusement so reported and cause the same to be closed.

Buildings of Class V. Hereafter Erected.

Sec. 357. The following provisions shall apply to buildings hereafter erected and used wholly or in part for the purposes of Class V.

Sec. 358. **(Walls.—Outside Walls.—Structures Built Above.)**—The outside walls of all such buildings, the roofs or ceilings of which are carried on trusses or girders of a span of fifty feet or more, shall be as follows:

If such walls are less than twenty-five feet high they shall not be less than twenty inches thick.

If they are more than twenty-five feet and less than forty-five feet high they shall be not less than twenty-four inches thick.

If they are more than forty-five feet and less than sixty feet high they shall be not less than twenty-eight inches thick.

If they are more than sixty feet and less than seventy-five feet high they shall be not less than thirty-two inches thick.

If they are more than seventy-five feet and less than ninety feet high, they shall be not less than thirty-six inches thick.

An increase of four inches in thickness of such walls shall be made in all cases where they are over one hundred feet long without cross walls of equal height.

The thickness of the enclosing or surrounding walls of rooms used for the purposes of Class V., where such rooms are less than fifty feet wide, may be reduced by four inches.

If one or more stories are built above any room devoted to the uses of Class V., and such stories are carried on trusses or girders, the thickness of walls shall be increased by four inches for each two stories or part thereof above such room.

If solid masonry buttresses are employed and placed eighteen feet or less apart, and extended to the foot of the trusses or girders carrying the ceiling, or if iron or steel columns are inserted in such walls for the support of the superstructure, and at distances not more than twenty-four feet between centers,, and if such columns extend to and carry the superimposed trusses or girders, the thickness of such walls may be reduced in proportion to the increase of strength afforded by such buttresses or columns, but in no case shall any such wall be less than twelve inches thick in the top story, and four inches shall be added, going downward, for each story, for each gallery, or for each twenty-five feet in height of wall.

Sec. 359. **(Columns in Walls.)**—If iron or steel columns are introduced in such walls, the brickwork around such columns shall be bonded into the brickwork of the connecting wall, and each of such columns shall be fireproofed, as provided in Section 511 of this chapter.

Walls Around Stairs, Elevators and Shafts.—See Section 588.

Sec. 360. **(Construction.—Frontage.—Open Spaces and Enclosed Passages.)**—All buildings hereafter erected and used wholly or in part for the purposes of Class V. shall be built entirely of fireproof construction and shall be located so that they adjoin at least two public thoroughfares, one of which shall be a public street, and the other may be a public alley not less than ten (10) feet in width.

All floors, balconies and galleries of the audience room of every theater shall have open spaces or fireproof passageways on the three sides other than the proscenium; and on each of the two opposite sides other than the back and proscenium of every stage there shall be open spaces or fireproof passageways, and such open spaces or fireproof passageways shall open on or connect directly with the public thoroughfares.

All open spaces shall not be less than ten (10) feet in width and all fireproof passageways shall not be less than eight (8) feet in width, and shall be outside of the audience room, and shall be kept and maintained free and clear of obstructions of any and all kinds at any and all times.

Provided, however, that where said theater does not seat more than five hundred persons on the main floor, the width of such fireproof passageway on each side of the

auditorium on the main floor may be reduced to five feet for that portion of passageway immediately adjoining the auditorium.

The width of such passageways shall be increased twelve (12) *inches for each* 100 *additional seating capacity or fraction thereof of such main floor, until the maximum now required by law, namely, eight* (8) *feet, is reached, but no such passageway shall be less than five* (5) *feet in width in this class.*

As amended Nov. 25, 1907.

All open spaces shall be open and unobstructed from the floor or pavement of such space to the sky, with the exception that emergency stairs and emergency balconies may be built in such open spaces. The entire floor of every open space shall be level or inclined; the incline shall not exceed two (2) inches in height for each one foot of horizontal measurement.

If one or more fireproof passageways are required on one side of the stage, then the fireproof passageways of each floor and the balcony and each gallery of the audience room shall be continued through the stage house as fireproof passageways to an open space or public thoroughfare, and from the end of each such fireproof passageway there shall be doors or stairs, or both, which shall be arranged so as to afford a safe exit for the audience of such theater to the pavement of the public thoroughfares, and if fireproof passageways are required on both sides of the stage, then they shall be arranged and connected with all of the fireproof passageways on both sides of the audience room in the same manner as described for fireproof passageways when these are required only on one side of the stage.

The fireproof passageways for the main floor may pass under the stage floor.

Provided, however, that where there is no public thoroughfare or open space at the back of the stage and on one side of the stage, then the fireproof passageways for the main floor shall be on the stage floor and shall be built along that side of the stage on which there is no public thoroughfare and across the back of the stage to one of the public thoroughfares, and the fireproof passageways for the balcony and the fireproof passageways for the galleries shall each be built along the side of the stage and across the back of the stage, in a continuation of the balcony and gallery floor level to a public thoroughfare.

The fireproof passageways of the different floors, of the balcony and of the galleries, shall be independent of each other and shall not be connected with each other in any manner.

No doors or other openings except entrance doors from the audience room or exit doors to a thoroughfare shall be in the walls of a fireproof passageway; and all such doors shall be so arranged that when open they shall not obstruct the passage.

The walls of a fireproof passageway shall be not less than four (4) inches thick, and each and every part of such passageway, including each and all of its supports, shall be built of fireproof construction as required in the general provisions relating to fireproof construction of this chapter.

Radiators for warming passageways shall be in recesses.

There shall be no steps or risers in a fireproof passageway, but where necessary inclined floors of the full width of the fireproof passageways may be built; the incline of the floor shall not exceed two and one-half (2½) inches in height per foot, measured horizontally, and no such incline shall be less than ten (10) feet in length. No fireproof passageway shall be less than eight (8) feet high in any part thereof, except at doors, and these shall not be less than seven (7) feet high.

If the principal entrance corridor of a theater is at one side of the audience room, then the center line extended of such principal entrance shall intersect the center axis of the stage and the audience room between the back of the seat most remote from the stage on said center axis of the stage and the audience room, and a point midway between such seat and the wall opposite the proscenium wall.

Sec. 361. **(Buildings of Other Classes Built in Conjunction With Class V.—Construction of.)**—If buildings used wholly or in part for purposes of Class V. are built in conjunction with or as part of buildings devoted to the uses of other classes, then such buildings of other classes shall be built entirely of fireproof construction.

Sec. 362. **(Floor Levels.—Limitation Of.)**—In all cases where the floors of the auditorium of any theater in any such building of Class V. are banked or stepped up, the floor level of the lowest bank shall not be above the sidewalk level.

All floors shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of floor construction, permanent fixtures and mechanisms that may be set upon the same, a live load of one hundred pounds for every square foot of surface in such floors.

The audience room or rooms or auditorium or auditoriums used for the purposes of Class V. containing, in the aggregate, not more than five hundred seats, if in a fireproof building, may be located in any story thereof, but in such case there shall be at least two separate stairways from the floor or floors in which such audience

room or auditorium is located to the ground, each of which stairways shall be not less than four feet in width in the clear.

Sec. 363. (Stairways.—Entrances and Exits.)—Stairways affording ingress to or egress from any room used for the purposes of Class V. shall be in width equivalent to twenty inches for every one hundred of seating capacity of such room, and for fractional parts of one hundred a proportionate part of twenty inches of width shall be added, but in no event shall any such stairway be less than four feet wide in the clear, except as hereinafter provided.

All such stairways shall have hand railings on each side thereof, and shall not ascend a greater height than thirteen feet six inches without a level landing, and the length and width of such landing shall be not less than the width of the stairs; no run of stairs shall consist of less than six risers between platforms, and risers shall not be placed on return platforms. Stairways which are over seven feet wide shall have double intermediate handrails with end newel posts at least five and a half feet high.

Steps shall not have a greater rise than seven and three-eighths inches, treads shall not be narrower than eleven inches, and winders shall not be used on any staircase.

Each and every balcony and gallery shall have separate and distinct entrances and stairways from the sidewalk level. The bottom run of the stairs shall be directly toward the street. Such stairs may ascend from the vestibule or entrance inside of the building, but the bottom riser of such stairs shall be not more than sixty-five feet from the building line. All doors between such stairs and the street shall be kept unlocked and unfastened during each and every performance and until the audience has left the building.

There shall be an iron stairway or stairways from the stage to the fly gallery and gridiron, continuing to the roof of the building or to some fireproof passageway or exit. Such stairways may be circular. Such circular stairways, however, shall not be used for access to the dressing rooms.

Stairs leading to a box or boxes seating not to exceed thirty people in the aggregate shall be independent of all other stairs and seats, and not less than two feet eight inches wide in the clear. For each additional twenty-five of seating capacity or major portion thereof in such box or boxes there shall be an additional five inches in width of such stairway.

All stairways on the stage side of the proscenium wall shall be not less than two feet six inches wide.

Sec. 364. (Floors at Exits—Seating.)—Floors at all exits shall be so designed as to be level and flush with adjacent floors and shall extend for an unbroken width of not less than four feet in front of each exit, and shall be two feet wider than such exit.

More than ten seats in any one row between aisles shall not be lawful.

Seats shall be not less than twenty-two inches in width, measured at the top of the seat backs.

Rows of seats shall not be less than two feet ten inches from back to back.

No bank of seats shall have a greater rise than twenty-two inches.

All groups of seats shall be so arranged that there shall be an aisle at each side of each group, provided groups of five seats or less may abut upon a tunnel at one side and an aisle at the other side.

The number of banks of seats on the main floor shall not exceed fifteen, unless an intervening or cross aisle is provided between each fifteen banks of seats or a direct exit is provided for each aisle. The number of banks of seats in the "balcony" shall not exceed nine, unless an intervening or cross aisle is provided between each nine banks of seats or a direct exit is provided for each aisle.

Sec. 365. (Tunnels.—Cross Aisles.—Vertical Rise.—Foyer.)—There shall be no more than eleven feet rise, measured vertically, in any aisle in any gallery without a direct exit by tunnel or otherwise, to a corridor with free opening on to the gallery stairs or other direct discharge to the street, or at any such elevation of eleven feet an intervening or cross aisle leading directly to an exit. No tunnel shall be less than three feet wide in the clear.

No foyer shall be open to the theater proper except through the exits.

Sec. 366. (Main Floor.—Balcony and Gallery.—Designation Of.)—The lower floor shall be designated the "Main floor."

Where there are balconies or galleries the first balcony or gallery shall be designated the "Balcony," and the second and third balcony or gallery shall be designated, respectively, "Gallery" and "Second Gallery." Such designation shall be printed plainly on all admission tickets.

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Sec. 367. (Aisles and Passageways.—Kept Unobstructed.—Steps in Aisles.)—The minimum width of aisles with diverging sides in any room or auditorium used for the purposes of Class V. shall be two feet eight inches at the end near the stage, and not less than three feet at the other end.

The minimum width of aisles with parallel sides shall be three feet.

Every aisle shall lead directly to an exit. Steps shall not be permitted in aisles except as extending from bank to bank of seats, and no riser shall be more than seven and three-eighths inches in height, and no tread shall be less than ten inches in width, and whenever the rise from bank to bank of seats is less than five inches, the floor of the aisles shall be made as an inclined plane; and where steps are placed in outside aisles or corridors they shall not be isolated, but shall be grouped together, and a light shall be maintained so that every place where there are steps in enclosing aisles or corridors shall be clearly lighted. All aisles, passageways, corridors and exits shall be kept free from camp stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any such aisles, passageways, corridors or exits during any performance, service, exhibition, lecture, concert or at any public assemblage.

Sec. 368. (Corridors.—Passageways.—Hallways and Doors.—Width of Entrance Doors.)—The width of corridors, passageways, hallways and doors shall be computed in the same manner as that hereinbefore provided for stairways, excepting, however, that no corridors shall be anywhere less than four feet in width and no doorway less than three feet wide, except as otherwise herein provided.

All corridors, passageways, hallways and stairways leading from any balcony or gallery to any toilet room, retiring room, smoking room, cloak room, check room or private office shall permit of free passage, without returning, to an outer exit of the building. Such corridors, passageways, hallways and stairways shall be at least three feet in width in every part between such balcony or gallery and such outer exit, and shall be unobstructed in every part, except by doors not less than three feet in width in the clear, which shall swing outward and which shall not be provided with locks or catches of any kind whatever.

The entrance doors to every theater shall be of sufficient width to accommodate the entire audience, computed on the basis of twenty inches of width in the clear to each one hundred permanent seats or proportionate part thereof in the audience room or auditorium of such theater, and all doors shall be so arranged that when open they shall not obstruct any corridor or passage whatsoever into which they open.

No mirrors shall be so arranged as to give the appearance of a doorway, exit, hallway or corridor, when no such doorway, exit, hallway or corridor is really in existence, nor shall there be any false doors or windows giving the appearance of an opening where none really exists.

Sec. 369. (Emergency Exits, Width.—Emergency Stairs, Width.—Emergency Exits Inside Walls of Buildings.—Fire Escapes, Construction.—Fire Escapes Leading to Street or Alley.—Doors Open Outward.)—Emergency exits and stairways shall be provided separately for each floor, balcony or gallery. They shall be of the same size as that provided for the main exits, and no emergency exit, doorway or stairway shall be less than three feet in width. Such emergency stairway shall be made of iron, steel or other incombustible material. Such emergency exit shall be kept free of obstructions of any kind, including snow and ice.

Such emergency exits and stairways may be built inside the walls of the building, provided they are surrounded by a fireproof partition not less than four inches thick, separating the exits and stairways from the audience room or auditorium.

If such emergency exits lead outside the building, the openings leading thereto shall have metal door frames and metal doors with panels filled with fire-resisting glass, opening outward, hung from the inside corner of the jambs, and so constructed as not to project when opened beyond the outside face of the wall, and outer shutters shall not be permitted.

Whenever any such emergency stairway passes over an exit or door or window or other opening, such stairway shall be completely enclosed for a space of five feet greater in width than such opening, by iron, steel or other incombustible material.

All such emergency exits and stairways shall land at the ground level in a public thoroughfare or in some space that connects directly with a street or alley, and direct and immediate exit to such public thoroughfare shall not be obstructed by any door, gate, bars or other obstruction of any character.

Every court in which there is an emergency stairway shall have direct and unobstructed access along the surface of the ground to a street, alley or yard opening into an alley or street without entering into or passing through or over any building unless by a four-foot wide fireproof passage on the court or ground level.

All doors in openings from emergency exits and stairways shall be so constructed that when opened they will not obstruct any portion of any other doorway, opening or passageway.

All doors affording ingress to or egress from any theater shall open outward upon suitable hinges.

Exit doors shall not be obscured by draperies and shall not be locked or fastened in any manner during the entire time such theater is open to the public, so as to prevent them from being easily opened outwardly; and such doors shall be so constructed and maintained as to require no special knowledge or effort to open them from the interior.

Sec. 370. (Wall.—Brick.—Proscenium Between Auditorium and Stage.—Steel Curtain Fireproofed on Stage Side.—No Combustible Material on Audience Side.—Plans for Curtain.—Permit from Building Department.—Inspection Fee.)—There shall be a solid brick wall of the same construction and thickness as is required in the outside walls of the building in which such theater is located between the auditorium and the stage.

The main proscenium opening shall have a vertically operated steel curtain which shall, when it is lowered, completely close such prescenium opening. The curtain shall be raised and lowered by mechanical power, other than hand power, as the regular curtain and act drop each and every time there is an audience in the theater.

The lowering of the curtain shall be controlled from not less than two points in the building, one of which shall be designated by the Commissioner of Buildings.

The curtain shall have a steel covering on the outer or auditorium side. The stage side covering shall be of a non-conducting substance of such a thickness and such material as shall stand a test of two thousand degrees F. on the stage side for fifteen minutes and without heating the opposite side to a higher temperature than three hundred and fifty degrees F.

All metal work with the exception of the frame shall be covered with a non-conducting substance on the stage side.

The curtain shall operate vertically in steel guides of such a cross section that the edges shall engage and secure the edges of the curtain and prevent the curtain from leaving the guiding channel or channels if the curtain should tend to buckle or bag either inward or outward. No metal in the guide channels or in the engaging edge of the curtain shall be less than three-eighths (⅜) of an inch thick. The joints of the curtain with the proscenium wall, with the stage floor and with the head of the opening shall be made gas tight as nearly as practicable.

The calculations for the strength of the curtain, the curtain guides and the guide anchors, and the workmanship shall be according to the best modern engineering practice, the stresses in the material and in the various sections of steel shall be within the safe limits of stress described in this ordinance.

No part of a curtain or of the curtain guides shall be supported by or fastened to any combustible material.

The supports of the curtain and the curtain guides and edges and the curtain shall be of sufficient strength to safely resist a pressure of twenty (20) pounds for each and every square foot of the curtain either inward or outward, if such curtain does or does not bag.

No combustible material other than painted decorations shall be applied to the audience side of any such curtain.

Plans for every such curtain shall be approved by the Building Department and a permit obtained for its erection. The Building Department shall inspect such curtain semi-annually, and for each such inspection a fee of two (2) dollars shall be charged.

All other openings in such proscenium wall shall have self-closing, regulation standard iron fire doors and iron frames and thresholds; such doors and frames shall be built in such a manner as to resist warping.

Sec. 371. (Stage, Construction of.—Fireproof Paint.—Scenery.—How Treated.)—The framing of the floor of every stage shall be of iron or steel or fireproof material. The stage floor may be of wood, but shall not be less than two and three-fourths inches thick. The entire floor construction and floor of fly galleries, rigging lofts and paint galleries, all railings and supports and stanchions thereon, and all sheaves, pulleys and cables and their supports shall be of iron or steel. All woodwork, including the under side of floor boards, and all framing for scenery used on or about the stage shall be coated with a fireproof paint, the qualities of which shall be submitted to and approved by the Commissioner of Buildings. All wood used for floor and floor supports shall be coated on the under side with the same kind of paint.

No scenery or stage paraphernalia of any sort shall be used upon the stage of any room used for the purposes of Class V., unless such scenery and paraphernalia shall have been treated with a paint or chemical solution which shall make it non-inflammable, and which treated scenery or stage paraphernalia, or both, shall be tested and approved by the Fire Marshal.

Sec. 372. (Vestibules for Stage Doors.)—All doorways or openings in the rear or sides of the stage shall be vestibuled or protected in a manner satisfactory to

the Commissioner of Buildings, so as to protect the curtain, scenery and auditorium against draughts of air.

Sec. 373. (Structures Over Ceiling.—Construction.)—If any structure is built over the ceiling or roof of any theater, the different members of the girders or trusses supporting same shall have their fireproofing double, in the manner prescribed for columns of fireproof buildings as specified in the General Provisions of this chapter.

Sec. 374. (Vents.—Size Of.—Flue Pipes.—Dampers.—Switches for Dampers.)—One or more vents or flue pipes of metal construction, or other incombustible material, suitable for carrying away smoke, and approved by the Commissioner of Buildings, and extending not less than fifteen feet above the highest point of the roof, and equivalent in area to one-twentieth of the area of the stage, shall be built over the stage.

In buildings where additional stories are built above the stage, such vents or flue pipes may be carried out near the top of the stage walls, and shall be continued and run up on the exterior of the building to a point five feet above the highest point of such additional story.

All such flues or vents shall be provided with metal dampers, and shall be opened by a closed circuit battery, approved by the City Electrician.

Such dampers shall be controlled by two switches, one at the electrician's station on the stage, which station shall be fireproof, and the other at the city fireman's station, on the opposite side of the stage; such switches shall be located in such places on the stage as are designated by the Fire Marshal, and each shall have a sign with plain directions as to the operation of the same printed thereon.

All fuse boxes shall be surrounded by two thicknesses of fireproof material, with an air space between, and no fuses shall be exposed to the air between the switchboards.

Sec. 375. (Automatic Sprinklers.—Location.—Tank.—Connections.)—There shall be provided an approved system of automatic sprinklers with approved automatic closed circuit electric devices connecting the valves, regulating the flow of water into the various sprinkler pipes with the headquarters of the city fire alarm telegraph, and such other place or places as the Fire Marshal shall direct, so arranged as to prevent any tampering with the system or the shutting off of the water from the sprinkler pipes without automatic notice to the fire department.

Such system of automatic sprinklers shall be supplied with water from a tank located not less than twenty feet above the level of the highest sprinkler head in the system, and it shall be the duty of the firemen provided for in this chapter to include in their daily report the result of an inspection to determine the sufficiency of water in this tank. Automatic sprinklers shall be placed in the paint room, store room, property room, scene storage room, carpenter shop and dressing rooms, if such rooms are in or connected with a building used for the purposes of Class V. Such tank shall not be connected with a standpipe and ladder system, but it shall be filled through a separate pipe from a fire pump, and a three-inch iron pipe shall extend from such tank to the outside of such building with Siamese connections for fire department use. Such entire automatic sprinkler system and equipment and the location thereof shall be subject to the approval of the Fire Marshal.

Sec. 376. (Fire Apparatus on Stage.—Hand Fire Pumps.—Fire Materials.—Hot Air Furnaces.)—A standpipe not less than three inches in diameter, having a hose valve or valves thereon shall be installed on each side of the stage with a hose connection at the stage and at each level above and below the stage, and hose connected thereto at each valve ready for use at all times. Such standpipes shall be connected with a tank on the roof containing not less than three thousand gallons of water, protected from frost, and such tank shall be connected with and supplied by a power pump, all of which shall be subject to the approval of the Fire Marshal. Portable fire extinguishers or hand fire pumps shall always be kept ready for use on and under the stage, in fly galleries and in rigging loft, and in addition thereto at least four fire department axes and six pike poles shall be kept ready for use on each tier or floor of the stage, all of which shall be subject to the approval of the Fire Marshal.

The use of ordinary hot air furnaces or stoves is prohibited.

Sec. 377. (Exits—Diagram of.—Printed on Programs.)—It shall be the duty of the owner, lessee or manager of any theater, for any performance in which programs are issued, to cause to be printed on such programs on the page opposite that on which the cast is printed, a diagram showing conspicuously all exits of such building. A diagram of seats on each floor, and the exits leading from each floor, drawn to a scale of one-eighth inch to the foot, shall be hung in a frame within two feet of the ticket seller's window and so as to be easily seen by the public.

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Sec. 378. (Independent Lighting System for Exits.—Red Light Over Exits.)—All stairways and corridors shall be supplied with a supplementary lighting system of electricity, gas or sperm oil, and such system shall be independent of all other lights in such building, and shall be in operation during the entire period such theater is open to the public and until the audience has left the building. The word "EXIT" shall be in letters at least six inches high over the opening to every means of egress from such theater and a red light, furnished by gas or sperm oil, shall be kept burning over such word "EXIT" at every such opening, during the entire period such theater is open to the public and until the audience has left the building.

Sec. 379. (Fire Alarm Apparatus.)—Every theater shall be provided with an approved system of automatic or manual fire alarm telegraph apparatus, connected by the necessary wires with the headquarters of the city fire alarm telegraph and such other place or places as the Fire Marshal shall direct. The number and location of the boxes and the character of the system, whether automatic or manual or both, shall be determined by the Fire Marshal.

Sec. 380. (Firemen.—Employment of.—Duties.)—Amended by ordinance June 8, 1908, to read as follows:

It shall be the duty of every person, firm or corporation conducting, operating or maintaining a theater to procure at his, their or its own expense, the attendance at each and every performance, of one fireman who shall be detailed by the Fire Marshal from the regular City Fire Department; he shall be in the uniform of the Chicago Fire Department and he shall be on duty at such theater during the entire time it is open to the public. He shall report to and be subject to the orders of the Fire Marshal and shall see that all fire apparatus required by this Chapter is in its proper condition, ready for use and that all exit doors are unlocked during the entire time such theater is open to the public and are all in efficient and ready working order. During the performance he shall remain on the stage and shall generally perform such duties as may be required of him by the rules and regulations of the Fire Department governing firemen detailed at theaters.

It shall also be the duty of every person, firm or corporation conducting, operating or maintaining a theater to employ, in addition to the fireman hereinbefore provided for, one other experienced and competent person as a private watchman or fireman who shall be approved by the Fire Marshal and who shall be in distinctive uniform and shall be on duty at such theater during the entire time it is open to the public. Such private watchman or fireman shall report and be subject to the orders of the Fire Marshal and it shall be his duty to see that the provisions of this Chapter are complied with in all portions of the theater occupied and used by the public, and that all exit doors are unlocked during the entire time such theater is open to the public, and in efficient and ready working order. The city fireman and Fire Marshal shall require a drill of the employes of such theater, including such private watchman or fireman, in the use of all apparatus and appliances for the prevention of fire inside the building and the saving of life, at least twice in every week, and such city fireman shall report to the Fire Marshal the manner and efficiency of such drill. Such city fireman shall report in writing daily to the Fire Marshal the condition and equipment of the theater to which he is detailed. No city fireman shall be on duty at any one theater for a longer period than two weeks.

The compensation to be paid the city for the services of such city fireman so detailed shall be based on the regular salary paid by the city to such fireman and shall be computed according to the ratio between the number of hours such fireman is required by his duties hereunder to devote to such theater and the total number of hours such fireman is employed by the city for all purposes. All sums received by the city under the provisions of this section shall be for the use and benefit of the Fire Department.

Sec. 381. (Amusement License.)—The amusement license issued for each theater shall state the number of permanent seats it contains, which number shall be governed by the provisions of this chapter relating thereto, and no more than that number of persons shall be permitted in such theater at any one time.

No license for the operation of a theater shall be issued unless the Commissioner of Buildings, Fire Marshal and City Electrician shall first have certified, in writing, that such theater complies with the provisions of this chapter in every respect.

Sec. 382. (Lighting.—All Parts Well Lighted During Performances.)—Every portion of any theater, devoted to the uses or accommodation of the public, and all outlets therefrom, to the streets, including open courts, corridors, stairways, exits and emergency exit stairways, shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises.

Sec. 383. (Lights, Control of Lights in Halls, Corridors and Lobbies.—Separate Shut-off.—Connections With Gas Mains.—Independent Connections.—Protection of Suspended and Bracket Lights.—Protection of Lights Inserted in Walls.—Protection of Footlights.—Construction of Border Lights.—Ducts and Shafts Conducting Heated Air

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from Lights.—Gas Stage Lights to Have Metal Screens.)—All gas or electric lights in the halls, corridors, lobbies or any other part of any theater used by the audience, except the auditorium, shall be controlled by a separate shut-off located in the lobby and controlled only in that particular place. Gas mains supplying such theater shall have independent connections for the auditorium and the stage and provision shall be made for shutting off the gas from the outside of the building. All suspended or bracket lights surrounded by glass, in the auditorium, or in any other part of the theater, shall be provided with proper wire netting underneath. No gas or electric lights shall be inserted in the walls, woodwork, ceiling, or in any part of the theater unless protected by fireproof materials. In case gas is used, for the footlights, in addition to the wire network, they shall be protected by a strong wire guard, not less than two feet distant from such footlights, and the trough containing such footlights shall be formed of and surrounded by fireproof material. All border lights shall be constructed according to the best known methods, and subject to the approval of the Fire Marshal and the City Electrician, and shall be suspended by wire ropes. All ducts and shafts used for conducting heated air from the main chandelier, or from any other light or lights, shall be constructed of metal and made double, with an air space between. All gas stage lights shall have strong wire metal guards or screens, not less than ten inches in diameter, so constructed that any material coming in contact therewith shall be out of reach of the flames of such lights, and shall be soldered to the fixtures in all cases.

The use of calcium lights in any theater is prohibited. All arc lights used on the stage shall be at all times subject to the approval of the City Electrician, and no arc lights shall be used on any stage unless approved by the City Electrician.

Sec. 384. (Fire Apparatus to Be Under Control of Fire Department.)—The standpipes, automatic sprinklers, gaspipes, electric wires, hose, footlights, fire alarm boxes, fireproof proscenium curtains, switch boxes, ventilators, controlling levers, axes and pike poles, and all apparatus for the extinguishing of fire or guarding against same, as provided for by this chapter, shall be made and kept at all times in condition satisfactory to and under control of the Fire Marshal.

Sec. 385. (Officers Empowered to Enter Buildings.)—The Commissioner of Buildings, Fire Marshal, City Electrician, Superintendent of Police, or any of them, and their respective assistants, shall have the right to enter any buildings used wholly or in part for the purposes of Class V., and any and all parts thereof, at any reasonable time, and at any time when occupied by the public, in order to examine such buildings and to judge of the condition of the same and to discharge their respective duties, and it shall be unlawful for any person to interfere with them or any of them in the performance of their duties.

Sec. 386. (The Commissioner of Buildings, Fire Marshal, City Electrician or Superintendent of Police Shall Close Buildings for Violations.)—The Commissioner of Buildings, Fire Marshal, City Electrician or Superintendent of Police, or any of them, shall have the power and it shall be their joint and several duty to order any building used wholly or in part for the purposes of Class V. closed, where it is discovered that there is any violation of the provisions of this chapter, and to keep same closed until such provisions are complied with.

Sec. 387. (License.—Mayor Shall Revoke.)—Upon a report to the Mayor by the Commissioner of Buildings or Fire Marshal or City Electrician or the Superintendent of Police that any requirement of this chapter, or that any order given by them or any of them, in regard thereto, has been violated, or not complied with, the Mayor shall revoke the license of any such theater or place of public amusement so reported and cause the same to be closed.

ARTICLE IX.

PROVISIONS RELATING SOLELY TO CLASS VI.

In Class VI. shall be included every tenement and apartment house; that is to say, any house or building, or portion thereof, which is used as a home or residence for two or more families living in separate apartments.

Sec. 388. (Walls of Class VI.—Thickness of.)—Buildings of Class VI. shall conform to the following requirements:

The thickness of enclosing walls of buildings of Class VI shall be made in accordance with the following table, to wit:

		STORIES											
	Basement.	1	2	3	4	5	6	7	8	9	10	11	12
Basement and	12	8											
Two-story	12	12	8										
Three-story	16	12	12	12									
Four-story	20	16	16	12	12								
Five-story	20	16	16	16	12	12							
Six-story	20	20	16	16	16	12	12						
Seven-story	24	24	20	20	16	16	12	12					
Eight-story	24	24	24	20	20	16	16	12	12				
Nine-story	28	24	24	20	20	20	16	16	12	12			
Ten-story	28	24	24	24	20	20	20	16	16	12	12		
Eleven-story	28	28	24	24	24	20	20	20	16	16	12	12	
Twelve-story	32	28	28	24	24	24	20	20	20	16	16	12	12

Provided, however, in buildings of steel skeleton fireproof construction, thickness of walls shall be governed by the provisions of Section 510 of this chapter.

Walls Around Stairs, Elevators and Shafts.—See Section 588.

Walls.—Reinforced Concrete.—See Section 554.

Sec. 389. **(Definitions.)**—"New tenement house" includes every tenement house hereafter erected and every such new tenement house which shall be increased or diminished in size or otherwise altered after its erection, and every building now or hereafter in existence not now used as a tenement house, but hereafter converted or altered to such use.

"Apartment" is a room or suite of two or more rooms occupied or intended or designed to be occupied as a family domicile.

"Yard" is an open, unoccupied space on the same lot with a tenement house, separating every part of every building on the lot from the rear line of the lot.

"Court" is an open, unoccupied space, other than a yard, on the same lot with a tenement house; a court entirely surrounded by a tenement house is an "inner court;" a court bounded on one side and both ends by a tenement house and on the remaining side by a lot line is a "lot line court;" a court extending to a street, alley or yard is an "outer court."

"Shaft" includes exterior and interior shafts, whether for air, light, elevator, dumb waiter or any other purpose; a "vent shaft" is one used solely to ventilate or light a water closet compartment, bath room, or pantry.

"Public Hall' is a hall, corridor or passageway, not within an apartment.

"Stair Hall" includes the stairs, stair landings, and those portions of the public halls through which it is necessary to pass in getting from the entrance floor to the top story.

"Basement" is a story partly, but not more than one-half—"Cellar" is a story more than one-half—below the level of the street grade nearest the building; where the grade of a street adjacent to a tenement house varies, the mean or average grade of such street opposite the lot containing the tenement house shall be regarded as the grade of such street within the meaning of this chapter.

"Story" is that portion of a building between the top of any floor beams and the top of the floor or ceiling beams next above.

A good quality of brick, laid in lime mortar, of strength and character equal to the requirements of Section 587 of this chapter, for brick walls, shall be taken as the standard of strength and stability for "solid masonry," but any other fireproof materials of equal strength and stability to the above standard may be substituted for brick.

Sec. 390. **(Construction of Partitions Between Apartments in Frame Buildings.)**—Every new tenement house more than five stories and basement high shall be of fireproof construction (according to the definition of "fireproof construction" contained in Section 500 of this chapter); every new tenement house more than three stories and basement high, but not more than five stories and basement high, shall be of "slow-burning" or "fireproof construction" (according to the definition of "slow-burning" or "fireproof construction" as defined in this chapter). In case slow-burning construction be used the cellar and basement construction, including the floor construction of the first story above the cellar or basement, shall be of fireproof construction. *In all new frame tenement houses outside the fire limits of the city each suite of apartments shall be separated from the next suite in such building by a wall of four-inch tile or metal studding and metal lath.*

As amended by ordinance of October 22, 1906.

In all new frame tenement houses outside the fire limits of the city, each suite of apartments shall be separated from the next suite in such building by a wall of incombustible material of such character as the Commissioner of Buildings may require.

Sec. 391. **(Joists.—Supports for.)**—If in buildings of Class VI. the distance between the enclosing walls is more than twenty-four feet in the clear, there shall be intermediate supports for the joists, which supports shall be either brick walls or iron or steel. If brick walls are used for this purpose they may, in all cases where the thickness of walls is given in the table as 16 inches or more, be made 4 inches less in thickness than the dimensions stated in the table.

Walls.—Ledges in.—See Section 588.

Sec. 392. **(Fire Escapes.)**—Every tenement house four or more stories in height shall be provided with a fire escape or fire escapes, such as are required by the statutes of this state and the ordinances of the city. In every case each separate apartment shall have direct access to at least one such fire escape unless such apartment shall have direct access (without passing through any other apartment) to at least two separate flights of stairs leading to the ground, one of which is placed in front and one in the rear of such building, and one of which may be placed outside of the building; but where such separate apartment shall not have access to two such flights of stairs, then there shall be a metal stairway between the balconies of every such fire escape, securely fastened to the walls of the building not less than two feet wide, with a proper hand rail, instead of the usual vertical ladder. Every court in which there shall be a fire escape shall have direct and unobstructed access along the surface of the ground to a street, alley, or yard opening into the alley or street, without entering into or passing through or over any building, unless by a four-foot wide fireproof passage on the court or ground level.

Sec. 393. **(Fire Escapes to Be Painted.)**—Every new fire escape shall be painted with two coats of durable paint, one put on in the shop and the other at once upon the erection of such fire escape.

Sec. 394. **(Bulkheads and Scuttles.—Stairs to.)**—Every tenement house shall have in the roof a bulkhead or scuttle, fireproof or covered with fireproof materials, with stairs or ladder leading thereto; no such roof opening shall be less than two feet by three feet. No scuttle or bulkhead door shall have upon it any lock, but may be fastened on the inside by movable bolts or hooks.

Sec. 395. **(Stairs and Halls.—In Case of Alterations.—Requirements.)**—Every now existing and every new tenement house shall have at least two flights of stairs, which shall extend from the entrance floor to the top story. Such stairs and the public halls in every tenement house shall each be at least three feet wide in the clear, and every apartment shall be directly accessible from both such flights of stairs. If any existing tenement house be so altered as to increase the number of apartments therein, or if such building be increased in height, or if the halls and stairs therein be damaged by fire or otherwise to an extent greater than one-half the original cost thereof, the entrance, stair halls, entrance halls and other public halls of the whole building shall be made to conform to the requirements of this chapter as to new tenement houses.

Sec. 396. **(Railings and Guards.)**—In every tenement house all stairways shall be provided with sufficient railings and guards.

Sec. 397. **(Stairs in Non-Fireproof Buildings, Eighty to One Hundred and Twenty Rooms.)**—Every new non-fireproof tenement house containing over eighty rooms, exclusive of bath rooms, shall have one additional flight of stairs (over and above the flights hereinbefore provided for) for every additional eighty rooms, or fraction thereof; but if such building contains not more than one hundred and twenty rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building shall be at least one-half wider than is provided in Sections 395 and 402 of this chapter.

Sec. 398. **(Stairs in Fireproof Buildings One Hundred and Twenty Rooms and Upward.)**—Every new fireproof tenement house containing over one hundred and twenty rooms, exclusive of bath rooms, shall have one additional flight of stairs (over and above the flights hereinbefore provided for) for every additional one hundred and twenty rooms or fraction thereof; but if such building contains not more than one hundred and eighty rooms, exclusive of bath rooms, at the owner's option, in lieu of an additional stairway, the stairs and public halls throughout the entire building shall be made at least one-half wider than is provided in Sections 395 and 402 of this chapter.

Sec. 399. **(Stairs.—Entrance to.—Treads and Risers.)**—Every flight of stairs required in a tenement house shall have an entrance on the entrance floor from a street or alley, or from a yard or court which opens into a street or alley. All stairs except rear stairs, in new tenement houses, shall have risers not more than seven and three-quarters inches high and treads not less than nine and one-half inches wide exclusive of nosings, except in winding stairs, where all treads at a point eighteen inches from the strings on the well side shall be at least nine and one-half inches wide, exclusive of nosings.

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Sec. 400. (Stairs and Stair Halls.—Over Three Stories.—Fire-Resisting Glass.)—The stairs and stair halls in all new tenement houses more than three stories and basement high shall be constructed of incombustible material throughout, except that the treads of stairs (not less than one and three-fourths inches thick) and all hand rails, may be of hard wood. All windows in stair halls in new tenement houses more than three stories and basement high opening on inner courts or shafts shall be of good quality fire-resisting glass.

Sec. 401. (Stair Halls Enclosed in Masonry.—Requirements and Exceptions.)

Amended by ordinance of February 18, 1907, to read as follows:

In every new non-fireproof tenement house all stair halls shall be enclosed on all sides with the walls of solid masonry of the same dimensions and thickness as specified for enclosing walls. All windows in such stair halls shall have metal frames and sashes, glazed, fire-resisting glass and such windows shall be stationary. This section shall not apply to tenement houses which are not more than three (3) stories and basement high with onty one apartment on each floor.

Sec. 402. (Entrance Halls.—Solid Masonry.—Exceptions.—Ceilings.)—Every main entrance hall in a new tenement house shall be at least three feet six inches wide in the clear from the entrance up to and including the stair enclosure, and beyond this point at least three feet wide in the clear. In every new non-fireproof tenement house, except where there is only one apartment on each floor, such entrance hall shall be inclosed with solid masonry walls and with ceilings covered with incombustible material and shall comply with all the conditions of the preceding sections of this chapter as to the construction of stair halls. If such main entrance hall is the only entrance to more than one flight of stairs, the several portions of such main entrance hall which separate the entrance of the building from the several flights of stairs respectively shall be increased respectively at least one foot in width for each additional flight of stairs.

Sec. 403. (Frame Buildings Not to Be Enlarged.)—No wooden frame tenement house within the fire limits shall be enlarged either by adding to its height or to its superficial area.

Sec. 404.—(Bay Windows—Vent Shafts.—Openings.)

Amended by ordinance of February 8, 1907, to read as follows:

All bay windows and all shafts and courts, in masonry constructed new tenement houses, shall have the walls of the bay windows, shafts and courts built of brick or other fireproof construction throughout. This section shall not apply to enclosures about elevators which are in common with a stairway surrounded and enclosed in masonry walls.

Sec. 405. (Apartments Divided by Masonry.)—There shall be a wall of solid masonry of the same thickness as required for outside walls in buildings of this character, extending from the ground to the roof between each set of apartments and around each well hole, court or light shaft; provided, however, that the wall between apartments above the first story extending from a main stair hall to the outer wall of the building may jog or set over to some point toward the center of the building to provide or allow for an even distribution of space of the rooms adjacent to the same; provided, however, that such wall above the first story, if supported on iron or steel beams (which shall extend from the brick wall surrounding the main stair hall to the outer wall of the building at each succeeding story), shall be not less than eight inches in thickness, but all brick walls between apartments and around each well hole, court or light shaft which extend from the ground to the roof and above the first story of an apartment building not supported as above described in this section, shall be of the thickness prescribed for buildings of this class in Section 388 of this chapter.

Sec. 406. (Space Occupied on Lot.—Plat Measurements.)—No new tenement house, alone or with other buildings now or hereafter erected, shall occupy above the first story more than eighty-five per centum of the area of a corner lot or more than ninety per centum of the area of such corner lot, if such corner lot is bounded on three sides by streets or alleys, or more than seventy-five per centum of the area of any other lot, provided, that the space occupied by fire escapes, constructed and erected according to law and not more than four feet wide, shall be deemed unoccupied.

At the time of applying for a permit for the erection of a new tenement house the applicant shall submit a plat of the lot showing the dimensions of the same and the position to be occupied by the proposed building, and the position of any other building or buildings that may be on the lot. The measurements shall in all cases be taken at the top of the first story and shall not include any portion of any street or alley.

Sec. 407. (Corner Lot Defined.—Frontages.—Triangular Lots.)—By "corner lot" is meant a lot situated at the junction of two streets or of a street and public alley not less than sixteen feet in width. Any portion of the width of such lot distant more than fifty feet from such junction shall not be regarded as part of a corner lot, but shall be subject to the provisions of this chapter respecting other than corner lots.

Where, in corner lots, the two frontages are of unequal length, the lesser street frontage shall be taken as the width of the lot. Street frontage alone and not alley frontage shall be considered in determining such lesser frontage. No existing tenement house shall hereafter be enlarged or its lot be diminished or other buildings be placed on its lot, so that after such change a larger proportion of any corner lot or other lot upon which it is situated is covered by buildings than the aforesaid proportions, respectively; provided, however, that in case of a lot triangular or irregular in shape, bounded on two or more sides by a street and having a number of lineal feet street frontage *exceeding* one-twentieth of the number of square feet in the area of such lot, it shall not be necessary to comply with the conditions of this section as to percentage of lot to be covered; and provided, further, that there shall be no violation of Section 411 of this chapter in the erection of any tenement house.

Amended October 22, 1906, by the substitution of the word "exceeding" in lieu of the word "extending," in fourth line from bottom of section.

Sec. 408. (Fire Walls.—When Dispensed With.)—Fire walls of brick not less than twelve inches thick shall be built, extending above the roofs of all adjoining buildings, if such roofs are flat, and also where the building stands upon any line of any lot, excepting street or alley lines. Provided, that where eight-inch walls are permitted in the top story of buildings, or where the building is not over three stories high, the fire walls may be eight inches thick. Such fire walls, where they stand upon lot lines or where they are over the dividing walls between buildings or over the dividing walls in the interior of buildings, where such are called for by this chapter by reason of the great area of such buildings, shall extend at least two feet above the roofs of such buildings. Fire walls upon street and alley lines shall extend not less than eighteen inches above the roofs of such buildings. Fire walls may be dispensed with on street and alley lines, if the top of the roof boards and roof joists are protected against fire for a distance of at least five feet from such street or alley lines by a coating of mortar or hollow tile or porous tile at least two inches thick. Fire walls at street and alley lines may also be dispensed with in all cases where the entire framing and material of the roof shall be made strictly fireproof.

Walls facing upon courts and light shafts shall be treated as in the same category with walls facing upon streets and alleys.

Fire walls shall be covered with a weatherproof coping of incombustible material.

Sec. 409. (Height.—How Measured.)—The height of a new tenement house shall not by more than one-half exceed the platted width of the widest street on which it abuts.

Provided, however, that any distance the building sets back from the lot line shall be added to the width of the street in making this computation, but no existing tenement house shall be increased beyond such height. Such height shall be the perpendicular distance from the grade nearest the house to the highest point of the roof (not including as part of the roof any cornice or bulkhead less than eight feet high, or any elevator enclosure less than sixteen feet high). Where such street grade varies, the mean or average grade thereof opposite such house shall be the datum from which such height shall be measured.

Sec. 410. (Alley or Yard in Rear.—Must Have.—Size of Yard Increased.)—At the rear of every lot containing a new tenement house (unless the rear of such lot abuts upon a public alley at least ten feet wide) there shall be a yard open and unobstructed from the earth to the sky, except by fire escapes not more than four feet wide, constructed and erected according to law; every part of such yard shall be directly accessible from every other part thereof; such yard shall on corner lots (as above defined) have an area of at least eight per centum of the superficial area of the lot, and shall on other lots have an area of at least ten per centum of the superficial area of the lot. Every such yard shall be increased one per centum of the superficial area of the lot for every story above three stories in height of the tenement house situated thereon, and in no case shall such yard separate any building on such lot by less than ten feet from the rear line of the lot at the nearest point of approach of such building to such rear line.

For the purpose of construing and enforcing this section, the rear of the lot shall be held and deemed to be that part of the lot that is farthest from the line of the street upon which the proposed building will face, and in case where the proposed building will stand upon a corner lot or tract of land abutting upon two streets and an alley, in

all such cases the proposed building or buildings may extend from the front to the rear of such lot or tract. Nothing herein contained shall conflict with or modify any other provision of this ordinance.

As amended by ordinance January 8, 1906.

Sec. 411. **(Requirements in Case of Enlarging.—Distance between Buildings.)**—Amended by ordinance March 23, 1908, to read as follows:

No existing tenement house shall (unless the rear of the lot upon which it stands abuts upon a public alley at least ten feet wide) hereafter be enlarged or its lot line be diminished so that any building on such lot shall at any point approach nearer than ten feet to the rear line of the lot. Where a tenement house, now or hereafter, erected, stands upon a lot other than a corner lot, no other building shall hereafter be placed upon the front or rear of that lot, unless the minimum distance between such buildings be at least ten feet, if neither building exceeds the height of one story; or fifteen feet if either building exceeds the height of one story, but not the height of two stories; and so on, five additional feet to be added to such minimum distance of ten feet for every story more than one in the height of the highest building on such lot: Provided, however, that where a fireproof passageway seven feet in height and five feet wide with fireproof doors not less than four feet wide leading from the street to the yard and properly lighted is constructed, connected with the yard, so that the lowest portion of said fireproof passageway shall not extend more than four feet below the level of the sidewalk grade, said fireproof passageway shall be taken and accepted in lieu of the ten feet required herein between the rear of said building and the rear line of the lot where the yard and court comply with the requirements of Section 410 of the Revised Municipal Code of Chicago of 1905, as amended January 8, 1906: Provided, however, in case such fireproof passageway is constructed, there shall be for at least fifteen feet along the lot line a yard, and in no case shall such yard separate any building on such lot by less than ten feet from the rear line of the lot at the nearest point of approach of such building to the rear lot line, and that all parts of such yard shall be open and unobstructed from the earth to the sky, except by stairways or fire-escapes, and their necessary porches and landings which shall be constructed entirely of iron, concrete or incombustible material. And such fireproof passageways thus connecting with the yard shall only be permitted in connection with buildings or structures built on a corner lot facing upon two streets. Nothing herein contained shall conflict with or modify any other provision of this chapter.

Sec. 412. **(Courts, Porches.)**—Every court of every new tenement house shall be open and unobstructed at every point thereof from the bottom thereof to the sky, save by fire escapes or stairs or landings constructed and erected according to law and projecting not more than four feet into courts, which courts shall communicate directly without obstruction into a street, alley or yard. Where porches are constructed in courts, the amount of area of unobstructed space in such courts shall be exclusive of space occupied by stairs and porches. No rear porch shall be constructed which is more than eight feet in width where the construction is of combustible material, and no such rear porches shall be enclosed with other than incombustible material, as defined in Section 506 of this chapter.

Sec. 413. **(Rooms—Habitable—Windows—Vent Shafts.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

In every new tenement house every habitable room, excepting water closet compartments and bath rooms, shall have all windows open direct upon a street, alley, yard or court. The total area of the windows opening from such room (other than water closet compartments and bath rooms) upon a street, alley, yard or court, shall be at least one-tenth of the floor area of that room, and the top of at least one window shall be not less than seven feet above the floor, and the upper half of that window shall be made so as to open its full width. No window in any such room (other than pantries, water closet compartments and bath rooms) shall have less than ten square feet glass area, and in no such water closet compartment or bath room shall the total window area be less than three square feet glass area, or the width of any window less than one foot; and when any window ventilating any water closet compartment or bath room in any new tenement house opens into a vent shaft, no window from any room other than a water closet compartment, bath room, pantry or hall shall open into such vent shaft.

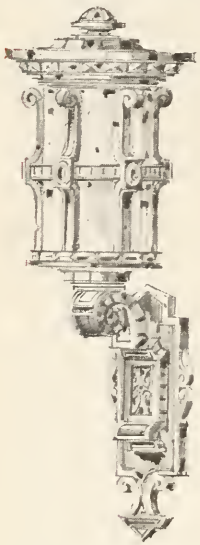
Sec. 414. **(Windows in Lot Line Walls.)**—Windows in addition to those provided for in Section 413 of this chapter, if placed in any lot line wall or in any wall nearer to the lot line than is specified in Section 416 of this chapter from such lot line, then the sash in such window shall be stationary and glazed with fire-resisting glass.

Section 414 repealed in its entirety by ordinance of February 18, 1907 (page 3336, Council Proceedings).

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Sec. 415. (Courts.—Inner.—Sizes Of.—Lot Line Courts.)—The "inner courts" of all new tenement houses as defined in Section 389 of this chapter shall have areas and minimum widths in all parts not less than the widths and areas as follows:

Buildings.	Square Feet.	Least Width.
2 stories	100	6 feet
3 stories	120	7 feet
4 stories	160	8 feet
5 stories	250	12 feet
6 stories	400	16 feet
7 stories	625	20 feet
8 stories	840	24 feet

"Lot line courts" shall have areas and minimum widths in all parts not less than one-half of those specified in the above table of "inner courts."

Sec. 416. (Courts.—Outer.—Sizes Of.—Width Increased.)—The "outer courts" of all tenement houses defined in Section 389 of this chapter shall have not less than the following widths for their minimum in all parts:

Buildings.	Least Width.
2 stories	3 feet
3 stories	3 feet 6 in.
4 stories	4 feet
5 stories	6 feet
6 stories	8 feet
7 stories	10 feet
8 stories	12 feet

If the outer or lot line court has windows on opposite sides of the same, the least widths given in the above table for outer courts shall be doubled.

Sec. 417. (Rooms.—Sizes and Height of.—Attic and Janitor's Rooms.)—In every new tenement house, all rooms, except water closet compartments and bath rooms, shall be of the following minimum sizes: In each apartment there shall be at least one room containing not less than one hundred and twenty square feet of floor area, and every other room shall contain at least seventy square feet of floor area. Each room shall be in every part not less than eight feet six inches high from the finished floor to the finished ceiling, but an attic room need be eight feet six inches high in but one-half of its area; provided, that in a basement apartment used for janitor's use only, such room or rooms shall be not less than eight feet high in the clear.

Sec. 418. (Rooms.—Changes in Existing.)—No room in any now existing tenement house shall hereafter be constructed, altered, converted or occupied for living purposes unless it contains a window having a superficial area not less than one-twelfth the floor area of the room, which window shall open upon a street or alley or upon a yard or court having a superficial area of not less than twenty-five square feet; or unless such room adjoins another room in the same apartment, which other room shall have such a window opening upon such a street, alley, yard or court, and between which two adjoining rooms there shall be a sash window having at least fifteen square feet of glazed surface, the upper half of which shall be so made as to open easily.

Sec. 419. (Windows.—Courts.—Attic.)—No room in any now existing tenement house which has no such window, as aforesaid, opening upon a street or alley or upon a yard or court having a superficial area of not less than twenty-five square feet, shall hereafter be constructed, altered, converted or occupied for living purposes, unless it contains a floor area of at least sixty square feet and also at least six hundred cubic feet of air space; nor unless every part of the finished ceiling of such room be at least eight feet distant from every part of the finished floor thereof; provided, that an attic room need be eight feet high in but one-half of its area and such attic room shall not be used for purposes of human habitation other than as a sleeping room

Sec. 420. (Air.—Quantity of for Each Person.)—No room in any tenement house shall be so occupied that the allowance of air to each person living or sleeping in such room shall at any time be less than four hundred cubic feet for each such person more than twelve years old, and two hundred cubic feet for each such person of the age of twelve years or under.

Sec. 421. (Alcoves.)

Amended by ordinance of February 18, 1907, to read as follows:

Alcove rooms must conform to all the requirements of other rooms, except that in one or two-story existing buildings which it may be desired to raise or alter, every alcove shall be deemed a separate room for all purposes within the meaning of this ordinance, except

such an alcove as, adjoining another room, has at least twenty per centum of entire wall surface of alcove opening to another room.

Sec. 422. (Light in Halls.—Recesses.—Returns.—Doors In.)—In every new tenement house every public hall shall be lighted by at least one window in each story opening directly upon a street, alley, yard or court, or by a skylight. Such window shall be so placed that light may pass directly through it and the hall to the opposite end of the hall, or else there shall be at least one window opening directly upon a street, alley, yard or court in every twenty feet in length or fraction thereof of every such hall, except in so much of any entrance hall as lies between the entrance and the flight of stairs nearest the entrance. In any such public hall, recesses or returns, the length of which do not exceed twice the width of the hall, will be permitted, without an additional window, but otherwise each recess or return shall be regarded for the purposes of this section as if it were a separate hall. Any part of a public hall which is shut off from any other part by a door or doors shall be deemed a separate public hall within the meaning of this section.

Sec. 423. (Public Halls.—Windows In.)—In every new tenement house one at least of the windows provided to light each public hall or part thereof shall have a glass area of at least twelve square feet.

Sec. 424. (Rooms and Halls.—Additional.)—Any additional room or hall that may hereafter be constructed or created in an existing tenement house shall comply in all respects with the provisions of this chapter as to size, arrangement, light and ventilation of rooms and halls.

Sec. 425. (Shafts.—Inner and Outer Vent.—Dimensions.)—Inner or outer vent shafts of all tenement houses as defined in Section 389 of this chapter shall be of the following dimensions:

Building.	Square Feet.	Least Width.
2 stories	22½	3 feet
3 stories	27	3 feet
4 stories	36	3 feet
5 stories	48	5 feet
6 stories	72	6 feet
7 stories	96	8 feet
8 stories	120	8 feet

Sec. 426. (Skylight Over Stairs.—Ventilating.—Area Of.)—In every new tenement house there shall be in the roof, directly over each stair well, a ventilating skylight, which shall have a glazed surface of the following dimensions: Where such tenement house shall not exceed two stories in height, and covering a superficial ground area of not to exceed sixteen hundred square feet, the glazed surface in such ventilating skylight shall be not less than fifteen square feet in area. For a three-story building, with a superficial ground area of not to exceed sixteen hundred square feet, the glazed surface of such ventilating skylight shall be not less than twenty square feet in area. For all buildings in excess of three stories and covering a superficial ground area in excess of 1,600 square feet, the glazed surface of such ventilating skylight shall be not less than twenty-five square feet in area; provided, however, that such ventilating skylights shall not be required in any of such buildings where the stairways are lighted by a window on each story landing.

If the building is more than three stories high, the skylights shall have at least six inches above same a strong wire netting (wire not lighter than No. 8 and a mesh not coarser than one and one-half by one and one-half inches) unless the glass contains a wire netting within itself.

Sec. 427. (Flues in Walls.)—In every new tenement house there shall be adequate flues in walls of masonry not less than forty-nine square inches area in each chimney running through every floor, with an open fireplace or grate or place for a stove, properly connected with one of such chimney flues, for every apartment, every additional flue used shall not be of less size than the above.

Sec. 428. (Cellar and Basement—Ceilings—Ventilation.)—Amended by ordinance Nov. 25, 1907, to read as follows:

All cellars and basements shall be ventilated at each end, and where boilers or furnaces are located the ceiling over the boiler or furnace, extending for two feet beyond boiler or furnace in each direction, shall be covered with metal lath and plastered, or any other incombustible material approved by the Commissioner of Buildings.

Sec. 429. (Damp-Proofing.—Basement Walls and Floors.)—Every new tenement house shall have all its outside walls below the adjacent ground level plastered on the outside with Portland cement or treated with other approved damp-proofing material, and such walls, as high as the ground level, shall be laid in cement mortar.

The basement or cellar shall have a floor of Portland cement concrete not less than three inches in thickness.

Sec. 430. (Cellar Changed for Living Purposes.—Requirements.—Height.)—In no now existing or new tenement house shall any room in the cellar be constructed, altered, converted or occupied for living purposes; and no room in the basement of a tenement house shall be constructed, altered, converted or occupied for living purposes, unless all of the following conditions of this chapter be complied with, and at least one-third of the height of the basement shall be above grade for building; provided, in each case it shall be at least four feet above the street grade. Such rooms shall be at least 8 feet 6 inches high in all now existing or new tenement houses in every part, from floor to the ceiling, except as provided for janitor's use only in Section 417 of this chapter.

Sec. 431. (Water Closet.)—There shall be appurtenant to such room or apartment, a water closet conforming to the regulations and ordinances of the city relating to water closets.

Sec. 432. (Shafts, Areas, Etc., to Extend Two Inches Below the Floor.—Graded.—Concreted.—Drained.)—In every new tenement house, the bottom of all shafts, courts and yards which extend to the basement and light and ventilate the living rooms in such basement shall, by means of areas, not less than two feet six inches in their least dimension or otherwise, be extended a distance of at least two inches below the floor level of the part intended to be occupied. All shafts, inner courts and areas which extend to the ground shall be properly concreted, and all shafts, inner and lot line courts and areas shall be properly graded and drained, and shall be so connected with a street sewer through an intermediate trap or surface basin (where such a sewer is adjacent to the lot), that all water may be drained freely into it.

Sec. 433. (Sinks.—Requirement.)—In every new tenement house there shall be in each apartment at least one proper sink with running water. In every now existing tenement house there shall be on every floor at least one proper sink with running water, accessible to all the tenants of that floor, without passing through any other apartment, if there be not one such sink in each apartment. In no tenement house shall there be woodwork inclosing sinks located in the public halls; the space underneath sinks shall be left entirely open.

Sec. 434. (Water Closets.—Access to.—Windows in.—Artificial Light.)—In every new tenement house there shall be a separate water closet in a separate compartment within each apartment, accessible to each apartment, without passing through any other apartment, provided that where there are apartments, consisting of only one or two rooms, there shall be at least one water closet for every two apartments. Every water closet compartment in every new tenement house shall have a window opening upon a street, alley, yard, court or vent shaft, and every water closet compartment in every existing tenement house shall be ventilated by such a window, or else by a proper ventilating pipe running through the roof. Every water closet compartment in every tenement house shall be provided with proper means of artificially lighting the same. If fixtures for gas or electricity are not provided in any such compartment, then the door thereof shall have ground glass or wire glass panels or transoms.

Sec. 435. (Sanitary Requirements.)—No drip trays shall be permitted in new tenement houses. All water closet fixtures in every new tenement house shall be constructed and set up comfortably to the requirements of the Department of Health. All privy vaults used in connection with any existing tenement house shall be replaced by water closets, constructed and set up in conformity with the provisions of this chapter, whenever connection with a public sewer is in any way practicable, and the Department of Health of the city shall be the sole judge as to the practicability of such connection with the public sewer. At least one such water closet shall be provided for every two apartments in each existing tenement house, and such water closets may be located in the yard if necessary. If so located, long hopper closets may be used, provided all traps, flush tanks and pipes be protected against frost.

Sec. 436. (Loads.—Allowance for Live Loads in Construction of Floors.)—For all buildings of Class VI. the floors shall be designed and constructed in such a manner as to be capable of bearing in all their parts, in addition to the weight of the floor construction, and including the weight of partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of forty pounds for every square foot of surface in such floors.

Sec. 437. (Pipes Through Floors.)—In every new tenement house where plumbing or other pipes pass through floors or partitions, the openings around such pipes shall be sealed or made air tight with plaster or other incombustible material, so as

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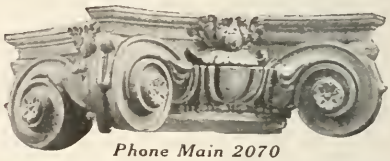
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to prevent the passage of air or the spread of fire from one floor to another or from room to room.

Sec. 438. **(Catch Basins.)**—The covers of all catch basins in lots containing tenement houses shall be of stone or iron, and shall be placed in courts or yards flush with the surface of such courts or yards, so that access to such basins may be convenient.

Sec. 439. **(Stairways.—Fire Escapes to be Free From Incumbrance.)**—No incumbrance of any kind shall at any time be placed before, upon or against any stairway, steps or landings or fire escapes in or upon any tenement house. All fire escapes upon tenement houses shall be kept in good order and repair, and every exposed part thereof shall at all times be protected against rust by durable paint.

Sec. 440. **(Water Closets.—Access To.)**—In every apartment of three or more rooms in every new tenement house convenient access from the outer door of the apartment to every living room and to every bedroom, and to every room used as a bedroom, and to at least one water closet compartment, shall be provided otherwise than through any bedroom or room used as a bedroom.

Sec. 441. **(Buildings Damaged by Fire, Etc.)**—If any existing tenement house is hereafter damaged by fire or other cause (including ordinary wear) so that at any time its value be less than one-half its original cost (exclusive of the value of the foundations) such building shall not be repaired or rebuilt except in conformity with the provisions of this chapter applicable to new tenement houses.

Sec. 442. **(Changes or Alterations.—Permits.)**—Every new tenement house and all changes or alterations in any existing tenement house shall conform to the requirements of this chapter. No new tenement house shall be begun, nor shall any changes or alterations in any existing tenement house, such as are referred to in this chapter, be begun until a permit therefor shall have been issued by the Building Department of the city. Such permit shall be issued only upon an application by the person for whom the building is to be erected or altered, and after approval of the plans and specifications of such tenement house, or such changes or alterations by the Health Department of the city whenever such approval is required by law or ordinance.

Sec. 443. **(Notice to be Sent to Commissioner of Buildings to Inspect.—Certificate to be Issued.—Notice to Inspect to be Filed.)**—It shall be the duty of the owner or his agent, when a tenement house is in course of erection, to notify the Commissioner of Buildings of the city when the building is or will be ready for lathing, and the Commissioner shall, within three days of the time specified, cause an inspection to be made, and if the construction is found to be in accordance with the requirements of this chapter he shall issue or cause to be issued a certificate to that effect; otherwise he shall cause the penalties provided in Section 445 of this chapter to be enforced. The Commissioner shall file for reference the notice received and shall also file a copy of the certificate in the office of the Building Department.

Sec. 444. **(Yards, Courts, Etc.—Must Comply as to.)**—Any tenement house not conforming in itself and in its yards, courts, areas and shafts to the requirements of this chapter shall not be occupied, or if found occupied shall forthwith be vacated upon notice from the Commissioner of Buildings, and such tenement house shall not again be occupied until made to conform in all respects with the provisions of this chapter, notwithstanding the issuance of a building permit for the erection or alteration of such building.

Sec. 445. **(Violations.—Penalty For.)**—Any owner, lessee, tenant, occupant or agent of any tenement house, or any architect, contractor, builder or foreman superintending or in charge of the work of construction of any tenement house violating, disobeying, neglecting or refusing to comply with or resisting the enforcement of any of the provisions of this chapter shall be fined not less than ten dollars nor more than two hundred dollars for each offense, and any violation of any provision of this chapter, if continued after the first fine is imposed, shall, for every week of such continuance, be punishable by an additional fine of not less than ten dollars nor more than two hundred dollars.

Sec. 446. **(Provisions of this Chapter not to Apply to Existing Buildings, Except Under Certain Circumstances.)**—Nothing in this chapter contained shall be considered as requiring alterations in the construction or equipment of buildings in existence at the time of the passage of this ordinance, and which at the time of their construction were built in compliance with the ordinances then in force, unless such building shall not have sufficient or adequate means of egress therefrom or ingress thereto by reason of insufficient or inadequate stairway or stairways improperly located or insufficient or inadequate elevators or elevator equipment, doors, fire escapes, windows or other means of egress or ingress.

If, however, it is desired to enlarge or in any manner materially modify the construction of any existing building, or to make any change in its use or occupation which will transfer it from one class, as defined by this chapter, to another class, then before such enlargement or structural change or modification of building is made, or before such change in its use or occupation may be made, the entire building shall be reconstructed or modified in such manner as to bring the same, when enlarged or altered, or when occupied for its new and different purposes, into accordance with the provisions of this chapter.

Sec. 447. **(Commissioner Shall Notify.)**—Where it shall appear to the said Commissioner that any such building has inadequate or insufficient means of egress therefrom or ingress thereto, as aforesaid, he shall notify the owner, agent or person in possession, charge or control of such building, of such fact, and direct him forthwith to make such alterations and changes in the construction or equipment of such building as are necessary to be made in order to promote the safety of the occupants of such building and of persons using the same and of the public.

Sec. 448. **(Where Conflicting with Other Sections.)**—In cases of direct conflict with the provisions of other sections of this chapter relating to other classes, the provisions of the sections relating to Class VI. shall govern in respect to tenement houses.

ARTICLE X

PROVISIONS RELATING SOLELY TO CLASS VII.

In Class VII. shall be included all buildings used for the sale at retail of dry goods and other articles of general merchandise and commonly known and described as "department stores."

Sec. 449. **(Buildings of Class VII.—Construction Of.)**—Buildings used either wholly or in part for the purposes of Class VII. three stories or less in height may be of ordinary construction.

Such buildings more than three and not exceeding five stories in height shall be of slow-burning, mill or fireproof construction.

Such buildings over five stories in height shall be of fireproof construction.

Sec. 450. **(Walls.—Thickness Of.)**—The thickness of inclosing walls shall conform to the following requirements:

		STORIES											
	Basement.	1	2	3	4	5	6	7	8	9	10	11	12
One-story	12	12											
Two-story	16	12	12										
Three-story	16	16	12	12									
Four-story	20	20	16	16	12								
Five-story	24	20	20	16	16	16							
Six-story	24	20	20	20	16	16	16						
Seven-story	24	20	20	20	20	16	16	16					
Eight-story	24	24	24	20	20	20	16	16	16				
Nine-story	28	24	24	24	20	20	20	16	16	16			
Ten-story	28	28	28	24	24	24	20	20	20	16	16		
Eleven-story	28	28	28	24	24	24	20	20	20	16	16	16	
Twelve-story	32	28	28	28	24	24	24	20	20	20	16	16	16

Provided, however, in buildings of steel skeleton, fireproof construction thickness of walls shall be governed by Section 510 of this chapter.

Walls, Ledges, Etc.—See Section 588.

Walls Around Stairs, Elevators and Shafts.—See Section 588.

Walls Reinforced (Concrete).—See Section 554.

Sec. 451. **(Stories Used for the Retail Sale of Goods.—Occupation of Basement.—Lockers.)**—Not more than the lower twelve stories above the street grade shall be used for the retail sale of goods, or for employes' locker rooms or for manufacuring purposes in a building devoted wholly or in part to purposes of Class VII., provided, however, the stories above the twelfth story may be used for these or other purposes when the stairs are built as described in Section 457 of this chapter.

Not more than one floor of any basement or cellar shall be used for the retail sale of goods. Such floor shall be the floor nearest to the inside street grade. Such floor used for the retail sale of goods shall not be more than twenty feet below the inside street grade.

No sub-basement, cellar or part of a basement below such floor shall be used for the sale of any goods in any manner, but locker and dressing rooms may be placed in the sub-basement, provided the space thus occupied be separated from the remainder of the basement by fireproof partitions, and that there be at least two flights of stairs placed as far apart as practicable leading therefrom to the

first floor inclosed in fireproof partitions as provided in Sections 533 and 534 of this chapter. Such stairs from such locker or dressing rooms shall be in addition to other stairways required by this chapter in such building, provided that at least one of such stairways shall open directly on a street, alley or court opening on a street or alley or a fireproof passage leading to the street, alley or such court. Where more than five lockers are in one room such lockers shall be of incombustible material.

Sec. 452. (Floor Areas.—Maximum.)—The floor area of any one story or portion of a story used for the purposes of Class VII. of any building of ordinary construction shall not exceed nine thousand square feet.

The floor area of any one story or portion of a story used for the purposes of Class VII. of any building of slow-burning or mill construction shall not exceed twelve thousand square feet.

The floor area of any one story or a portion of a story used for the purposes of Class VII. of any building of fireproof construction shall not exceed 25,000 square feet.

Sec. 453. (Floor Areas.—Exceeding the Maximum Limits Defined in Section 452.)—Where any floor or portion of a floor used for the purposes of Class VII. in any building shall exceed in area the maximum number of square feet allowed in the preceding section for the type of construction of such building in which such floor is contained, each such maximum amount of floor area so used shall be separated from other parts of such floor by fire walls or dividing walls built in accordance with the provisions of Section 259 of this chapter relating to dividing walls in buildings of Class I.

Where any such floor so used is divided by such fire walls or dividing walls, each such division of such floor shall be provided with stairs, aisles, exits and fire escapes, as is required in this chapter for separate and distinct buildings, and each such division shall be considered as a separate building.

Sec. 454. (Galleries.)—The area of any one or all of the galleries, mezzanine or intermediate floors in any one story used wholly or in part for the purposes of Class VII. in any building shall not exceed 10 per centum of the area of such story, and galleries, mezzanine or intermediate floors of a larger size than the above shall be considered as full stories.

Every gallery, mezzanine or intermediate floor shall have at least one stairway not less than three feet wide.

The height from the floor of any gallery, mezzanine or intermediate floor to the ceiling over same shall not be less than seven feet, and there shall be not less than seven feet space between the bottom of such gallery, mezzanine or intermediate floor, and the floor of the story in which such gallery, mezzanine or intermediate floor is placed.

Every gallery, intermediate or mezzanine floor used for the purposes of Class VII. in any building shall be built entirely of fireproof or incombustible construction with the exception of the floor surface and nailing strips, which may be of wood.

No gallery, intermediate or mezzanine floor shall be built without a permit from the Department of Buildings, and plans showing the construction and size of such proposed gallery, intermediate or mezzanine floor shall be filed with the Department of Buildings when a permit is applied for.

Sec. 455. (Courts of Class VII. Buildings.)—Every court or light shaft of every building used wholly or in part for the purposes of Class VII. shall be open and unobstructed from the floor of such court to the sky, with the exception that fire escapes may be built therein, and such court shall have walls constructed in the same manner as is required for the exterior walls of such buildings; provided, that no walls inclosing such courts are required on street or alley lot lines.

All windows, doors or other openings in court walls of such buildings shall have metal frames, metal sashes and metal doors, with the glazed portion thereof of fire-resisting glass.

Sec. 456. (Stories.—Numbering Of.)—The first story above the inside street grade shall be designated and known as the first story for all purposes of this chapter, and the stories above shall be numbered, consecutively, the second, third, and so on.

Sec. 457. (Stairways.—Interior Stairways in Buildings of Class VII.)—Buildings used wholly or in part for purposes of Class VII. shall have two stairways if the aggregate floor area is five thousand square feet or less, three stairways if the aggregate floor area is more than five thousand square feet and not more than ten thousand square feet, and four stairways if the floor area is more than ten thousand square feet.

The number of stairways and the aggregate width of stairways required for the various floor areas shall be as indicated in the table hereinafter set forth in the following section.

The width of the different stairways need not be alike, and for each four stories, or fractional number of stories, of the building above the first four stories, each stairway may be reduced by six inches, as set forth in the table of stairs in Section 458, but no stair in a Class VII. building shall be of a less width than three feet.

Stairways in buildings used wholly or in part for the purposes of Class VII. shall be located as far apart as practicable, and shall have hand rails on each side thereof, and no such stairway shall be a spiral stairway or have any winders. The height of the individual riser shall not exceed seven and three-eighths inches. The width of the individual tread shall be not less than ten inches. Stairways which are over seven feet wide shall have double intermediate hand rails with end newel posts at least five and one-half feet high.

The bottom of each stairway shall be in the immediate vicinity of the top of the stairs leading to the next lower story, and the line of travel from stairway to stairway shall be direct and easily accessible each to the other.

Every story below street grade shall have not less than two stairways to the first story and each such stairway shall be not less than three feet wide, but where a basement or a cellar is used for the retail sale of goods the stairways from such basement or cellar shall be in number and aggregate width as indicated in the table of stairways set forth in the following section for the lower four stories of the same building.

The whole number of stairways required for any such building shall be complete in every respect from the first floor to the topmost floor, and each stairway shall be extended to the roof.

Provided, however, that if any building used wholly or in part for the purposes of Class VII., be equipped with automatic sprinklers, and be connected with another building similarly used, and distant not less than twenty-five feet, and used by the same occupant, by a fireproof bridge or passageway similarly equipped, then each such bridge or passageway shall be held to be equivalent to and take the place of one outside stairway fire escape on each of the buildings so connected.

As amended by ordinance, October 29, 1906.

Sec. 458. TABLE OF STAIRWAYS FOR CLASS VII. BUILDINGS.

AGGREGATE WIDTH OF STAIRWAYS.

	SQUARE FEET OF				
Building Area.	1st, 2d, 3d, 4th, Story or Stories.	5th, 6th, 7th, 8th, Story or Stories.	9th, 10th, 11th, 12th, Story or Stories.	13th, 14th, 15th, 16th. Story or Stories.	
25,000	30 feet	27 feet	24 feet	21 feet	6 stairways
20,000	25 feet	22 ft. 6 in.	20 feet	17 ft. 6 in.	5 stairways
15,000	20 feet	18 feet	16 feet	14 feet	4 stairways
14,000	19 feet	17 feet	15 feet	13 feet	4 stairways
13,000	18 feet	16 feet	14 feet	12 feet	4 stairways
12,000	17 feet	15 feet	13 feet	12 feet	4 stairways
11,000	16 feet	14 feet	12 feet	12 feet	4 stairways
10,000	15 feet	13 ft. 6 in.	12 feet	10 ft. 6 in.	3 stairways
9,000	14 feet	12 ft. 6 in.	11 feet	9 ft. 6 in.	3 stairways
8,000	13 feet	11 ft. 6 in.	10 feet	9 feet	3 stairways
7,000	12 feet	10 ft. 6 in.	9 feet	9 feet	3 stairways
6,000	11 feet	9 ft. 6 in.	9 feet	9 feet	3 stairways
5,000	10 feet	9 feet	8 feet	7 feet	2 stairways
4,000	9 feet	8 feet	7 feet	6 feet	2 stairways
3,000	8 feet	7 feet	6 feet	6 feet	2 stairways
2,000 and less	7 feet	6 feet	6 feet	6 feet	2 stairways

Whenever any building of fireproof construction used wholly or in part for the purposes of Class VII., shall adjoin or be attached to a fireproof building, used by the same occupant, and having in its required intervening fire wall one or more openings, fitted with fire doors, on each side of the fire wall, having self-closing device thereon, as approved by the Building Department, then every such opening shall, for all purposes, be held to be equivalent to and take the place of and be regarded as a stairway, built and enclosed in the manner described in the following section (459). But in no case shall there be less than one stairway in any such building.

As amended by ordinance, October 29, 1906.

Sec. 459. **(Stairs.—Fireproof Interior.)**—Where an interior stairway and its stair hall of a building used wholly or in part for the purposes of Class VII. are inclosed in all stories of the building by fireproof partitions built as described in Section 533 of this chapter for fireproof construction, and where the stairways and landings are built as described in Section 534 of this chapter for fireproof construction, and where the doors, frames, sashes and casings and the glazed portions thereof are

built as described in Section 525 of this chapter for fireproof construction, then such stairway, if not less than five feet in width from first floor to the topmost floor, shall be considered as the equivalent of two open stairways, but in no case shall there be less than two stairways in any such building.

Sec. 460. **(Stories.—Where Stories Above Twelfth Are Used for Class VII. Purposes.)**—Where stories above the twelfth story are used for the purposes of Class VII. as hereinbefore described for employes' locker rooms, then the stairways from the first to the topmost floor shall be built and inclosed as described in the preceding section, but the stairways shall be in number and in their aggregate width as required in the table of stairways set forth in Section 458 of this chapter.

Sec. 461. **(Stairs.—Halls.—Passageways and Aisles.—Signs and Lights.)**—The stair halls, passageways or stair aisles shall be unobstructed and shall be as wide as the stairs, and not less than four feet wide in any place in the clear.

The exit door or doors between floors and stair halls shall be as wide as the stairway to which they afford access, and for each elevator opening into such a stair hall the doors to floors shall be increased to two feet in width.

The stairways and stair halls of any building used wholly or in part for the purposes of Class VII. shall be illuminated by gas or electric light, and the gas piping and the electric wiring shall be accomplished by piping and circuits separated and distinct from the general illuminating piping and circuits of the premises. Each stair light shall have a red glass inclosure.

At the bottom of each such stairway there shall be an illuminating red glass sign with the number of the story in which it is situated inscribed thereon in letters not less than six inches high.

Sec. 462. **(Aisles in Class VII. Buildings.)**—In buildings used wholly or in part for the purposes of Class VII. there shall be aisles in such portions of the building as are used for such purposes, connecting the stairways and the elevators directly with the street or alley doors, and such aisles shall be termed "main aisles." Such main aisles shall have a clear width equal to the width of the stairways connecting therewith, and for each elevator connecting with such an aisle there shall be an additional width of six inches, and no such main aisle shall be less than five feet wide in the clear between the counters in any department store or between the fixed seats therein. One-third the width of any basement stairway shall be added to the width of the main aisle connecting with such stairway.

If there is a column in any such aisle, then the width of the aisle shall be increased by the width of such column.

If there is a counter or counters or settee, or any case or other obstruction, in an aisle, then that part of the aisle on each side of such counter, settee or case or other obstruction shall be considered as a separate aisle. No aisle other than a main aisle shall be less than three feet in width.

Sec. 463. **(Exit Signs and Lights.)**—All exits in buildings used wholly or in part for the purposes of Class VII. shall be clearly indicated by illuminated red signs with the word "EXIT" thereon in letters not less than six inches high. At the bottom of each stairway on the street level floor there shall be similar signs indicating the direction of the nearest exit to a street or alley.

Fire escape doors or windows shall be indicated by illuminated red signs with the words "FIRE ESCAPE" thereon in letters not less than six inches high.

Sec. 464. **(Doors at Street Level.—Revolving Doors.)**—The clear width of the exit openings shall be computed in the same manner as that provided in this article for main aisles, and no door openings shall be less than five feet wide, and all doors shall swing outward. Revolving doors shall not be considered as exits, *unless the revolving wings of said revolving doors are so arranged that by the application of a force slightly more than necessary to revolve said doors and which one person of ordinary strength is capable of exerting, all the wings of said doors fold flat on each other and in an outward direction, and unless each side, or the half circles of such revolving doors, are hinged and fastened so as to likewise swing backwards on application of force slightly beyond the normal, and which will permit of exit space for two ordinary persons on either side of the collapsed wings of said revolving doors and their inclosing half circles.*

As amended by ordinance March 30, 1906, by addition of the part in italics.

Sec. 465. **(Doors in Dividing Walls.)**—Door openings may be built in dividing walls of such buildings, provided, however, that such door openings shall be provided with fireproof doors built as described in Section 260 of this chapter, and that each door shall have an efficient closing device, automatic in operation in the event of a fire, in close proximity to such door and on each side of such opening.

Each such opening shall have exit signs and lights as provided for street doors and exits in Section 463 of this chapter. There shall be aisles not less than

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five feet in width connecting with such doors from the main aisles, and in no case shall any such door be of less width than the aisle directly connecting therewith.

Doors and Windows.—When Required to Be Closed.—Fire Resisting Glass.—See Section 632.

Sec. 466. **(Floors.—Strength Of.—Allowance for Live Loads.)**—Every structural part of every building used wholly or in part for the purposes of Class VII. shall safely support, in addition to the weight of floor construction, partitions and permanent mechanisms that may be set upon the same, a live load of not less than one hundred pounds per square foot of floor area, and the construction shall be calculated according to the safe unit stresses elsewhere defined in this chapter. Every part of any such building which is subjected to a live load of more than one hundred pounds per square foot of floor shall be of sufficient strength in the parts which support such load to safely support the load imposed, calculated according to the safe allowable unit stresses elsewhere defined in this chapter.

Sec. 467. **(Fire Escapes in Class VII. Buildings.)**—Every such building more than two stories in height shall have two stairway fire escapes. Such stairway fire escapes shall each be not less than thirty-six inches wide between centers of hand rails. Such stairway fire escapes shall be at opposite ends of the building or as far apart from each other as practicable.

Sec. 468. **(Passageways.—Fireproof.)**—Where stairway fire escapes do not extend to the ground level they shall have a counterbalanced stairway to the ground from a platform not more than twenty feet above the ground level.

Fire escapes in inclosed courts shall have open, unobstructed fireproof passageways leading directly to a street or an alley.

Sec. 469. **(Fire Escapes.—Windows and Railings On.—Doors Opening On.)**—All windows and doors which are passed by a fire escape of any kind, and all windows and doors opening on fire escape platforms or landing shall have fireproof frames glazed with fire-resisting glass.

Each fire escape platform shall have at least one window on each floor in any such building opening thereon.

Each such window shall be indicated by signs and lights as required in Section 463 of this chapter for exits.

Where window sills at fire escape exits are more than two feet above the floor, one or more steps not less than three feet wide shall be provided, with risers not to exceed twelve inches high and treads not less than eight inches wide.

The railings on stairway fire escapes and the railings around fire escape platforms shall have iron guards in addition to the iron hand rails; such guards shall be not less than four feet high measuring from the outer corner of the tread or from the platform; such guards shall have a mesh or openings not over two and one-half inches square, and the metal strands in such guards shall have a cross section of not less than one-eighth of an inch in diameter.

Sec. 470 **(Fire Drill of Employes.)**—It shall be the duty of every person or corporation maintaining or in possession, charge or control of any building used wholly or in part for the purposes of Class VII. to designate certain adult male employes in such building (the number of which employes shall be prescribed by the Fire Marshal), who shall be regularly and throughout the entire time such building is open to the public employed in such building, and who shall be physically and mentally able to perform the duties which shall be required of them in case of fire occurring in any such building. Such employes shall at least once in each month, when directed by the Fire Marshal or any authorized member of the Fire Department, take part in a fire drill conducted by the Fire Marshal, or any authorized member of the Fire Department, in the use of all apparatus for the prevention and extinguishing of fire in such building, whenever the Fire Marshal shall deem such drill necessary or advisable. Such person or corporation shall pay to the city the proportion of the regular salary of any employe of the Fire Department who shall be employed in drilling and examining the employes of any such building, based upon the time of such employment, and the Fire Marshal shall render bills monthly for such services.

Sec. 471. **(Standpipes—Pumps—Axes, Etc.)**—Amended by ordinance of July 8, 1907, to read as follows (Superseding amendatory ordinance of March 19, 1906):

(1) *In every building over one hundred* (100) *feet in height not provided with a three* (3) *inch or larger inside standpipe, in all buildings hereafter constructed of a greater height than seventy-five* (75) *feet (except buildings used for theater purposes, as herein elsewhere provided for); in all buildings used for hospital purposes of a greater height than three* (3) *stories, with accommodations for at least twenty* (20) *patients; and in all buildings of a greater height than five* (5) *stories now or hereafter used for hotel or public lodging house purposes there shall be constructed one* (1) *or more four* (4)

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inch standpipes, which shall extend from basement to roof and which shall be connected at street or alley side of building with two-way Siamese connection for use of Fire Department, and which shall be provided with one hose connection, with Fire Department thread, on the roof of said building, on each floor and in the basement thereof, with sufficient hose attached to reach any point thereof. The pattern, quality, installation and maintenance of such standpipe, hose and couplings, shall be subject to the approval of the Fire Marshal.

(2) *In any of the buildings herein referred to where approved sprinkler systems are installed and properly maintained, it shall not be necessary to install additional inside standpipe as above provided for.*

(3) *On each floor and in the basement of every building used for hotel, public lodging, or school purposes, three or more stories in height, there shall be two* (2) *or more portable hand pumps or chemical extinguishers, one or more fire axes and one or more pike poles. In the basement or janitor quarters of all apartment buildings three or more stories in height, the floors of which are divided into two or more apartments, and in the basement of all office buildings four or more stories in height there shall be provided one or more portable hand pumps or chemical extinguishers, one or more fire axes and one or more pike poles; all of which shall be installed and maintained subject to the approval and supervision of the Fire Marshal.*

(4) *The interior of all grain elevators and malt houses of a height of fifty* (50) *or more feet, which are not entirely fireproof, and which have a capacity of two hundred and fifty thousand* (250,000) *bushels or over, and the interior of all cold storage houses of a height of four* (4) *or more stories, which are not entirely fireproof and which have a ground floor area of ten thousand* (10,000) *or more square feet, shall be equipped with either a dry or wet sprinkler system, to each of which systems there shall be a feeder or riser pipe or pipes not less than four* (4) *inches in diameter, leading from one or more Siamese steamer connections; all of which shall be installed and maintained subject to the approval of the Fire Marshal.*

(5) *Grain elevators which are equipped with Journal Fire Alarm Systems of the most approved pattern and which are left at all times in the most perfect working order, or grain elevators, malt houses and cold storage houses, which are now equipped with standpipes, of approved pattern and hose with not less than two* (2) *inch connections which have been installed in accordance with City ordinances and approved by the Fire Department, each floor of which is approved by said department as being at all times easily accessible to firemen, where fire extinguishers, water barrels and pails are distributed at intervals on all floors on advice and instruction of the Chicago Underwriters' Association; where the necessary pump pressure is maintained; where some approved electric watch service and fire alarm system is maintained and watchmen are employed during nights, Sundays and holidays, pulling such stations not less frequently than once per hour, and which have outside Siamese connections and standpipes not less than two and one-half* (2½) *inches, shall be exempt from the provisions of this ordinance.*

ARTICLE XI.

PROVISIONS RELATING SOLELY TO CLASS VIII.

In Class VIII. shall be included every building used exclusively for school purposes.

Sec. 472. **(Buildings of Class VIII.—Construction Of.)**—All buildings used wholly for the purposes of Class VIII. hereafter erected shall be constructed in accordance with the provisions of this chapter relating to Class VIII. as follows, viz.:

Such buildings having a seating capacity of less than four hundred, or which are not over two stories and basement in height, may be built of ordinary construction.

Such buildings having a greater seating capacity than four hundred and less than eight hundred, or which are not over three stories and basement in height, shall be built of slow burning or fireproof construction.

Such buildings having a greater seating capacity than eight hundred, and which are more than three stories and basement in height, shall be built entirely of fireproof construction.

New additions to existing buildings may be built; provided, however, that such new additions shall comply with the above requirements.

All alterations in existing buildings used wholly for the purposes of Class VIII., other than new additions thereto, intended to make them comply with the requirements of this chapter, may be executed in the same kinds of materials of construction at present employed in such buildings, unless otherwise distinctly provided herein.

Sec. 473. **(Frame Buildings.—Portable.)**—Portable frame buildings used wholly for the purposes of Class VIII., not larger than twenty-eight feet by thirty-six feet, and not over one story high, may be erected, provided the exterior walls and roof of same are covered with metal or incombustible material, and the interior wood-

work painted with fireproof paint, approved by the Commissioner of Buildings. And provided, further, that the location of such buildings shall be approved by the Commissioner of Buildings. Such portable buildings shall not be located nearer than ten feet to any other building, and shall not be maintained on any one lot or block for a longer period than two years after the date of the issuance of the permit therefor without a new permit from the Commissioner of Buildings.

Doors and Windows.—(When Required to Be Closed.—Fire-Resisting Glass.)—See Section 632.

Sec. 474. **(Walls.—Window Openings In.)**—No wall of any building used wholly for the purposes of Class VIII. containing a window opening shall be nearer than five feet to any lot line of adjoining property (street and alley lines not included).

Sec. 475. **(Walls.—Thickness Of.)**—The following regulations shall govern the construction of buildings used wholly for the purposes of Class VIII.:

The thickness of surrounding walls and of all dividing walls carrying the load of floors or roof shall be as indicated in the following table, to-wit:

(Walls Around Stairs, Elevators and Shafts.—See Section 588.)

		——STORIES——				
	Basement.	1	2	3	4	5
	in.	in.	in.	in.	in.	in.
One story	16	12				
Two stories	16	16	12			
Three stories	16	16	16	12		
Four stories	20	20	16	16	12	
Five stories	24	20	20	16	16	16

Buildings built of fireproof construction shall be excepted from the foregoing provisions of this section, but shall comply with the other provisions of this chapter governing such buildings.

Sec. 476. **(Loads.—Live.)**—The floors of buildings used wholly for the purposes of Class VIII. shall be designed and constructed so as to be capable of bearing in all their parts, in addition to the weight of floor construction, partitions, permanent fixtures and mechanisms that may be set upon same, a live load of seventy-five pounds per square foot.

Sec. 477. **(Stories.—Height Of.)**—No story above the basement shall be less than twelve feet in height in the clear.

Sec. 478. **(Floor Levels in Buildings of Fireproof Construction.)**—The following limitations of floor levels of auditoriums or assembly halls of such buildings shall be observed in all cases:

In buildings of fireproof construction.

Not to exceed two thousand seating capacity, not over ten feet above sidewalk level.

Not to exceed one thousand seating capacity, not over thirty feet above sidewalk level.

Not to exceed eight hundred seating capacity, not over fifty feet above sidewalk level.

Not to exceed five hundred seating capacity, in any story; provided, however, that there shall be at least two separate and distinct stairways from the floor in which such auditorium or assembly hall is located to the ground, each of which shall not be less than four feet wide in the clear.

Sec. 479. **(Floor Levels.—In Buildings Having Stairs and Corridors of Fireproof Construction.)**

Not to exceed one thousand five hundred seating capacity, not over ten feet above sidewalk level.

Not to exceed one thousand seating capacity, not over twenty-five feet above sidewalk level.

Not to exceed eight hundred seating capacity, not over forty-two feet above sidewalk level.

Not to exceed five hundred seating capacity, not over fifty feet above sidewalk level.

Not to exceed two hundred and fifty seating capacity, not over sixty feet above sidewalk level.

Sec. 480. **(Floor Levels in Buildings of Mill, Slow-Burning or Ordinary Construction.)**

Not to exceed one thousand seating capacity, not over ten feet above sidewalk level.

Not to exceed six hundred and fifty seating capacity, not over thirty feet above sidewalk level.

Not to exceed five hundred seating capacity, not over forty-five feet above sidewalk level.

Not to exceed two hundred seating capacity, not over sixty feet above sidewalk level.

Sec. 481. **(Floors.—Height Of, Measured from Sidewalk Level.)**—Heights shall be measured from sidewalk level at entrance of buildings to highest part of main floor of auditorium or assembly hall.

Sec. 482. **(Stairways.—Width Of.)**—Stairways in buildings used wholly for the purposes of Class VIII. shall be in width equivalent to fifteen inches for every hundred of seating capacity in such building, as measured by the aggregate seating capacity of the auditorium, assembly rooms and school rooms; provided, however, that the number of persons allowed in such buildings at any one time shall be limited by the width of stairways available as exits therefrom.

No stairway shall be less than four feet in the clear, except where more than two stairways lead down from any floor, in which case stairways three feet wide in the clear may be counted in the total width of stairways required.

Where two or more stairways are used, they shall be placed at opposite ends of the building, or as far apart as practicable, and all such buildings hereafter erected shall have at least two separate and distinct stairways from the ground floor to the top floor, and all existing buildings shall have two such separate and distinct stairways, or one stairway and one stair or sliding fire escape.

Sec. 483. **(Stairways.—Railings on Each Side.—Height of Landing.)**—All stairways shall have railings on each side thereof. No stairway shall ascend a greater height than thirteen feet six inches without a level landing, which, if its width is in the direction of the run of the stairs, shall be not less than four feet wide, or which, if at a turn of the stairs, shall be of not less width than the stairs, and no winder shall be permitted in any stairs.

Sec. 484. **(Stairways.—Fireproof.)**—In such buildings hereafter erected more than two stories and basement in height, the stairways and their enclosing walls shall be of fireproof construction.

Sec. 485. **(Corridors, Passageways, Hallways and Doors.—Width Of.)**—The width of corridors, passageways, hallways and doors shall be computed in the same manner as that herein provided for stairways; provided, however, that no corridor shall be anywhere less than five feet in width, and no door less than three feet in width, except where two or more doors, each two feet four inches or more in width, are grouped together.

Sec. 486. **(Doors to Open Outward.)**—All doors in such buildings shall open outward, and all entrance and exit doors shall be unlocked at all times when the building is occupied for school purposes, or open to the public.

Sec. 487. **(Doors.—Exits Covered with Metal.)**—All exit doors from assembly halls and class rooms to other parts of the building shall be covered with metal or other fireproof material, approved by the commissioner of buildings.

Sec. 488. **(Aisles.—Width Of.—Number of Seats in Auditorium.)**—Aisles in auditoriums and assembly halls in such buildings shall be in width equivalent to eighteen inches for every one hundred of seating capacity in such auditorium or assembly hall, but no such aisle shall be less than two feet six inches wide in its narrowest part. All groups of seats shall be so arranged that they shall have an aisle on each side, and not more than twelve seats in any one row shall be placed between aisles.

Sec. 489. **(Aisles in Class and Recitation Rooms.)**—Aisles in class rooms, recitation rooms and study rooms of such buildings shall be in width equivalent to eighteen inches for every one hundred permanent seats in any such room, but no main or cross aisle shall be less than two feet six inches wide in its narrowest part.

Sec. 490. **(Aisles and Passageways.—Kept Clear of Obstructions.)**—All aisles and passageways in such buildings shall be kept free from camp stools, chairs, sofas and other obstructions, and no person shall be allowed to stand in or occupy any of such aisles or passageways during any performance, service, exhibition, lecture, concert or any public assembly, nor shall there be any chairs, settees or camp stools in such aisles or corridors at such times or occasions.

Sec. 491. **(Emergency Exits for Auditoriums or Assembly Rooms.—Aggregate Width Of.)**—All auditoriums or assembly halls of such buildings having a seating capacity of eight hundred or more shall be provided with emergency exits. The aggregate width of such emergency exits which shall be provided for each floor, balcony or gallery of such auditorium or assembly hall shall be one-half of the width of the main exit. No emergency exit or stairway shall be less than three feet in width.

Sec. 492. **(Exits.—Signs.)**—All exits opening from auditoriums and assembly halls of such buildings shall have the word "EXIT," in letters at least six inches high, applied to the auditorium side of every such exit, and when such auditorium or assembly hall is used at night, a red light shall be kept burning over the word "EXIT" during the entire time such building is so used and until the pupils or audience have left the building.

Sec. 493. **(Lights in Buildings.)**—Every portion of any such building devoted to the uses or accommodation of the public and all outlets therefrom leading to the streets, including the open courts and corridors, stairways and exits, shall be well and properly lighted during the entire time such portion is in use, and shall remain lighted until all the pupils or the audience have left the premises. All gas or electric lights in the halls, corridors, lobbies, stairs and exits leading from the auditorium or assembly halls shall be controlled by a separate shut-off and shall be independent of all other lights in such building.

Sec. 494. **(Windows.)**—The total glass area of outside windows and skylights of each class room, recitation room or study room in such buildings shall be not less than one-ninth of the floor area of such room.

Sec. 495. **(Basement.)**—In every such building in which the lower or basement floor is below the surface of the ground surrounding such building, and is used in part or as a whole for heating or ventilating apparatus, such floor shall be considered the basement story of such building. Permanent class rooms in basements shall not be permitted.

Sec. 496. **(Fire Escapes.)**—Every building used for the purposes of Class VIII. of four or more stories in height shall be provided and equipped with one or more stairways or sliding fire escapes in such locations and numbers as shall be satisfactory to the Commissioner of Buildings.

Sec. 497. **(Fire Escapes to Be Examined.)**—It shall be the duty of the janitor of every such building, or such other employe or employes thereof as may be directed by the principal of such school to examine all fire escapes of such buildings from the topmost story to the ground, and to examine and operate all doors, windows and platforms leading to and from such fire escapes; and such inspection shall be made at least once each and every week that such building is used for school purposes, and a written report made of such inspection to the principal of such school, showing the time it was made and the condition of the fire escapes.

Such fire escapes shall be kept in good condition ready for immediate use at any and all times that such building is in use, and shall be kept free of snow and ice.

Sec. 498. **(Fire Drill.)**—The principal or other person in charge of the pupils in every such building shall establish and maintain a good and efficient fire drill, which shall be practiced at least twice every month during the time such building is used for school purposes.

A record shall be kept by the principal or other person in charge of the pupils of each fire drill held and of the time that elapses from the first fire signal until the last person is out of the building.

(Walls.—Around Stairs, Elevators and Shafts.)—See Section 588.

ARTICLE XII.

GENERAL PROVISIONS.

Fireproof Construction.

Sec. 499. **(Fireproof Construction.)**—In cases in which it is claimed that any equally good or more desirable mode or manner of construction, or material, or device for fireproofing, other than specified in this chapter, can be used in the erection or alteration of buildings, the Commissioner of Buildings, upon written application to him for a permit to use the same, shall have power to appoint a Board of Examiners, consisting of not less than three nor more than five members, each of whom shall have had at least ten years' experience in Chicago as an architect, engineer or builder, who shall take the usual oath of office. The said examiners shall adopt rules and specifications for examining and testing such mode or manner of construction, or material or device for fireproofing, and furnish a copy of the same to the applicant. And such specification shall provide for a comparative fire test of not less than four hours and for a period of at least two hours an average temperature of 2,000 degrees Fahrenheit shall be maintained. At the end of this test water shall be applied to the construction through a 1⅛-inch nozzle under 60 pounds pressure for five minutes. Hollow tile shall be used as a basis for comparison, and if the proposed material shall pass said test as well or better than hollow tile, it shall be approved as a fireproofing material. The said examiners shall thereupon notify such applicant to submit to such examination and make such tests in the presence

of the said examiners, or a majority thereof, according to such rules and specifications. All expenses of such examiners, and of such examinations and tests, shall be paid by the applicant, and said examiners may require security therefor.

The said examiners shall, after such examination and tests, certify the results and their decision on the said application to the Commissioner of Buildings, who shall have power, in the event of the examination and tests being satisfactory, to grant a permit to the applicant in accordance with such decision of the said Board of Examiners.

A complete record of the proceedings and all acts and decisions of the said Board of Examiners shall be kept by the Commissioner of Buildings in his office.

The Commissioner of Buildings shall have the power to pass upon any question relative to the mode or manner of construction or materials to be used for fireproofing in the erection or alteration of any building or structure to make the same conform to the true intent and meaning of the several provisions of this chapter.

Sec. 500. **(Fireproof Construction.—Definition Of.)**—The term fireproof construction shall apply to all buildings in which all parts that carry weights or resist strains, and also all exterior walls and all interior walls and all interior partitions and all stairways and all elevator enclosures are made entirely of incombustible material, and in which all metallic structural members are protected against the effects of fire by coverings of a material which shall be entirely incombustible, and a slow heat conductor, and hereinafter termed "fireproof material." Reinforced concrete as defined in this ordinance shall be considered fireproof construction.

Sec. 501. **(Fireproof Material.)**—The materials which shall be considered as filling the conditions of fireproof covering are: First, burnt brick; second, tiles of burnt clay; third, approved cement concrete; fourth, terra cotta; fifth, approved cinder concrete.

Sec. 502. **(Concrete.—Approved Cement.)**—All approved cement concrete shall consist of a standard Portland cement, torpedo sand and crushed stone or gravel, or crushed blast furnace slag, or crushed burnt clay, the volumetric quantity of any one of these materials combined with the torpedo sand shall not exceed nine times the volume of the Portland cement. All of the ingredients of cement concrete shall be thoroughly worked and wet so as to cover each piece of stone or gravel or slag or burnt clay with moistened cement; and the cement and sand shall fill the voids between the coarse material of the cement concrete.

Cement concrete to be considered a fireproof material shall be cast and rammed in an unset condition against the metal.

Sec. 503. **(Machine or Hand Pressed Concrete.)**—Machine or hand pressed concrete bricks or blocks are not considered in this chapter as a fireproof material for the protection of metallic structural members.

Sec. 504. **(Brick, Burnt Clay, Tiles, Etc.—How Applied.)**—Brick, burnt clay, hollow tiles, porous clay, solid tiles and terra cotta shall be applied to the metal in a bed of mortar.

Sec. 505. **(Fireproof Covering.—Minimum Thickness Of.)**—The minimum thickness of fireproof covering on any metal shall be, if of hollow tile, constructed in such a manner that there shall be not less than one air space of at least three-fourths of an inch, by the width of the metal surface to be covered, within the clay covering; if of porous clay tiles, the covering shall be at least one and one-half inches thick. The minimum thickness of concrete covering any metal shall be two inches.

Sec. 506. **(Incombustible Materials.)**—A metal or fire-resisting glass of not less than one-quarter inch in thickness, or plastering, or plaster blocks, or stone or granite, or marble, or an improved cinder concrete, or one of the fireproof materials described herein shall be considered an incombustible material as called for by this chapter.

Sec. 507. **(Concrete.—Cinder.—Floor Filling.—Specifications For.)**—Whenever the use of a cinder concrete is permitted by this chapter, such cinder concrete shall be composed of the following named ingredients, in the proportion here described, to-wit: Five parts of clean, thoroughly burnt steam boiler cinders, no particle of which shall be larger than one (1) inch; three parts of clean grit sand, or of clean stone screenings, and one part of a Standard Portland cement; the working and wetting of these ingredients shall be done in the same manner as required for cement concrete in Section 502 of this chapter, and such a mixture of approved cinder concrete may be used only for floor filling.

Sec. 508. **(Fireproof Covering.—Measurements.)**—In every case the thickness of the covering specified in this chapter shall be measured from the extreme projection of the metal, unless otherwise provided herein.

Sec. 509. **(Skeleton Construction.)**—The term "skeleton construction" shall apply to all buildings wherein all external and internal loads and strains are trans-

mitted from the top of the building to the foundations by a skeleton or framework of metal. In such metal framework the beams and girders shall be riveted to each other at their respective junction points. If columns made of rolled iron or steel are used, their different parts shall be riveted to each other, and the beams and girders resting upon them shall have riveted connections to unite them with the columns. If cast iron columns are used, each successive column shall be bolted to the one below it by at least four bolts not less than three-fourths of an inch in diameter, and the beams and girders shall be bolted to the columns. At each line of floor or roof beams, lateral connections between the ends of the beams and girders shall be made in such manner as to rigidly connect the beams and girders with each other in the direction of their length.

Sec. 510. (Walls.—Enclosing.)—If buildings are made fireproof entirely, and have skeleton construction so designed that their enclosing walls do not carry the weight of floors or roof, then their walls shall be not less than twelve inches in thickness; provided, such walls shall be thoroughly anchored to the iron skeleton, and whenever the weight of such walls rests upon beams or columns, such beams or columns shall be made strong enough in each story to carry the weight of wall resting upon them without reliance upon the walls below them. All walls shall be of fireproof or incombustible material.

Sec. 511. (Columns.—Exterior.)—All iron or steel used as a vertical supporting member of the external construction of any building exceeding sixty feet in height shall be protected as against the effects of external changes of temperature, and of fire, by a covering of fireproof material consisting of at least four inches of brick, or of four inches of concrete, or of four inches of burnt clay tiles, or of four inches of hollow terra cotta, or of a combination of any two of these materials, provided that their combined thickness is not less than four inches. The thickness of four inches shall be measured from the extreme projections of the metal of the column proper.

Where stone or other incombustible material is used for the exterior facing of a building, the distance between the back of the facing and the extreme projections of the metal of the column proper shall be at least four inches, and this four-inch space shall be filled with one of the fireproof materials.

In all cases, the brick or burnt clay, tile or terra cotta, if used as a fireproof covering, shall be bedded in cement mortar close up to the iron or steel members, and all joints shall be made full and solid.

Sec. 512. (Fireproofing of Exterior Sides of Mullions.)—In buildings required by this chapter to be of fireproof construction, all vertical door or window mullions over eight inches wide shall be faced with incombustible material; horizontal transom bars over six inches wide shall be faced with a fireproof or with an incombustible material.

Sec. 513. (Spandril Beams, Girders, Lintel.)—The metal of the spandril beams or spandril girders, or lintels of exterior walls, which support a part of exterior walls, shall be covered in the same manner, and with the same material, as specified for the exterior columns in this chapter. The covering thickness shall be measured from the extreme projection of the metal in every case.

Sec. 514. (Fireproof Covering Independent.)—All covering of brick, concrete, burnt clay tiles, hollow terra cotta or of a combination of any two of these materials shall be applied to all of the structural members of the exterior of a fireproof building previously and independently of the application of the architectural facing of such fireproof building with an incombustible or fireproof material.

Sec. 515. (Iron or Steel Plates for Support of Wall.)—If iron or steel plates or angles are used in each story for the support of the facings of the walls within such story, such plates or angles shall be of sufficient strength to carry the weight within the limits of fiber stress for iron and steel elsewhere specified in this chapter, the enveloping material for such story, and such plates or angles may extend to within two inches of the exterior of such covering.

Sec. 516. (Walls, Support and Fireproofing Of.)—Where skeleton construction is used for the whole or part of a building, the enveloping material and the walls shall be independently supported on the skeleton frame for each individual story.

Sec. 517. (Terra Cotta.)—If terra cotta or other hollow blocks are used, as fireproof covering, they shall be backed up with brick or hollow tile or concrete; whichever is used shall be, however, of such dimensions and laid up in such a manner that the backing will be built into the cavities of the facing so as to secure perfect bond between the facing and its backing.

Sec. 518. (Coping.)—The upper surfaces of all breaks or offsets in external coverings and fillings and walls, as well as the tops of walls, shall be covered with stone, terra cotta, metal, concrete or fire clay copings set in cement mortar. Copings of all kinds which do not have lapped joints shall be pointed with mortar composed of one part of standard Portland cement and two parts of torpedo sand.

Sec. 519. (Columns.—Interior.)—The covering of interior columns shall be one or more of the fireproof materials herein described.

If such covering shall be of brick or concrete it shall be not less than four inches thick; if of burnt clay tiles such covering shall be in two consecutive layers, each not less than two and one-half inches thick, with one air space; if of porous clay solid tiles it shall consist of at least two layers not less than two inches thick each, or if constituted of a combination of any two of these materials, one-half of the total thickness required for each of the materials shall be applied, of each of such materials. Whether hollow tile, porous tile or terra cotta is used, the two consecutive layers shall be so applied that neither the vertical nor the horizontal joints in the same shall be opposite each other, and each course shall be so anchored and bonded within itself as to form an independent and stable structure.

In all cases, the brick or hollow tile, solid tiles or terra cotta shall be bedded in cement mortar close up to the iron or steel member, and all joints shall be made full and solid.

In the case of columns having an "H" shaped cross section or of columns having any other cross section, with channels or chases open from base plates to cap plates on one or more sides of the columns, then the thickness of the fireproof covering may be reduced to three inches, measuring in the direction in which the flange or flanges project, and provided that the thin edge in the projecting flange or arms of the cross sections does not exceed three-quarters of an inch in thickness. The thickness of the fireproof covering on all surfaces measuring more than three-quarters of an inch wide and measuring in a direction perpendicular to such surfaces shall be not less than that specified for interior columns in the beginning of this section, and all spaces, including channels or chases between the fireproof covering and the metal of the column, shall be filled with a solid fireproof material. Lattice or other open columns shall be completely filled with approved cement concrete.

Sec. 520. (Foundations.—Steel In.—Concrete Around Bottom of Columns.)—If steel or iron in any form is used as part of a foundation, it shall be thoroughly imbedded in a concrete, the ingredients of which shall be such that, after proper ramming, the interior of the mass will be free from cavities. The steel or iron shall be entirely enveloped in approved cement concrete, and around the exposed external metal surfaces of such foundation there shall be a covering of approved cement concrete not less than four inches thick.

After the bases or base plates and columns have been set in place, both shall be protected from the effects of moisture by a covering of approved cement concrete applied direct to the metal in an unset state, measuring not less than two and one-half inches thick from the extreme projection of the metal, filled solid into all spaces, and forming a continuous concrete mass from the grillage or other foundations to an elevation six feet above the floor level nearest the column base plate or column stool.

Sec. 521. (Columns.—Wiring Clay Tiles On.)—Burnt clay tile column covering shall be secured by winding wire around the columns after the tile has all been set around such columns. The wire shall be securely wound around the tile in such manner that every tile is crossed at least once by a wire. If iron wire is used it shall be galvanized, and no wire used shall be less than No. 12 gauge.

Sec. 522. (Fireproofing.—Protective Covering For.)—In places where there is trucking or wheeling or other handling of packages of any kind, the lower five feet of the fireproofing of such columns shall be encased in a protective covering either of iron or oak plank, which covering shall be kept continually in good repair.

Sec. 523. (Pipes Inclosed by Covering.)—Pipes shall not be inclosed in the fireproofing of columns or in the fireproofing of other structural members of any fireproof building, provided, however, gas or electric light conduits not exceeding one inch inside diameter may be inserted in the outer two inches of the fireproof of such structural member.

Sec. 524. (Shafts, Etc.)—In cases where a pipe, conduit, dumb waiter, cable, wire, conveyor, belt or any combination thereof passes from one story to another story through an open hatch or floor opening, a shaft or enclosure of fireproof material shall be built from floor to floor around such hatch or floor opening, in each story above and below such hatch or floor opening in the same manner as described for fireproof partitions in this chapter. The area of space thus inclosed shall not exceed the area of the hatch or floor opening by more than one hundred per centum.

In no case shall any wood be used in the construction or support or fittings of such shaft as described above. If such holes in floors as described above in this section are not enclosed by such fireproof enclosures, then the open spaces in each floor opening not occupied by pipes, conduits, cables, wires, conveyors, belts or any combination thereof, shall be filled solid with fireproof material not less than eight inches thick

Sec. 525. (Shafts, Partitions Around, Plastering of Shafts, Doors and Windows.)—All burnt clay or terra cotta partitions or walls around shafts having openings in floors shall be plastered on the outside and plastered or pointed on the inside.

All doors, frames, sashes, casings and windows in partitions or walls around floor openings, or around stair shafts or elevator shafts, shall be built of incombustible material. The supports of such doors, frames, sashes, casings and windows shall also be of incombustible material; in the case of doors, such supports shall be of rolled structural metal extending from floor to ceiling and secured to both. Where there are brick walls of twelve inches or more in thickness, the supports need not extend to ceiling as above specified. All glass used in connection with such partitions or walls shall be fire resisting.

Sheet metal work pressed over asbestos paper and wood may be used for the doors, frames, sashes and casings, and for openings in such partitions, except for elevator doors in shafts and where the provisions of this chapter require all metal doors.

Sec. 526. (Beams and Girders, Coverings Of.)—The beams and girders of the interior structural parts of a building shall be covered by one of the fireproof materials, so applied as to be supported entirely by the beam or girder protected, and shall be held in place by the support of the flanges of such beams or girders and by the cement mortar used in setting. If metal binding or metal anchors are used as fastenings of such fireproof covering, such metal binding or such metal anchor shall be protected by not less than one-half inch of fireproof covering.

If the covering is of brick it shall be not less than four inches thick; if of hollow tiles or if of solid porous tiles, or if of terra cotta, each of such tiles shall be not less than one and one-half inches thick, applied to the metal in a bed of cement mortar; hollow tiles shall be constructed in such a manner that there shall be one air space of at least three-fourths of an inch by the width of the metal surface to be covered within such clay coverings; the minimum thickness of concrete on the bottom and sides of metal shall be two inches.

The top of all girders and beams shall be protected with two inches of brick or one and one-fourth inches of burnt clay, or two inches of approved cement concrete, or three inches of approved cinder concrete. The brick or burnt clay shall be bedded solid on the metal in cement mortar.

In all cases of beams or girders, in roofs or floors, no matter what the material or form of the floor arch used, the protection of the bottom flanges of the beams and girders and so much of the web of the same as is not covered by the arches shall be made as hereinbefore specified for the covering of beams and girders. In every case the thickness of the covering shall be measured from the extreme projection of the metal, and the entire space or spaces between the covering and the metal shall be filled solid with one of the fireproof materials excepting the air spaces in hollow tile.

Sec. 527. (Girders and Trusses.)—All girders or trusses, when supporting loads from more than one story, shall be fireproofed with two thicknesses of fireproof material or a combination of two fireproof materials, as required for exterior columns in Section 511 of this chapter, and each covering of fireproof material shall be bedded solid in cement mortar.

All other girders or trusses supporting only a ceiling or roof shall be covered with a fireproof covering as specified for beams and girders in Section 526 of this chapter.

Sec. 528. (Cut-Out Boxes, Chases, Etc.)—No electric service cut-out box, switch box, cabinet, chase or any other recess, shall encroach on the minimum thickness required for any fireproof covering on structural metal, except as provided in Section 523 of this chapter. If the depth of any cut-out box, switch box, cabinet, or chase, or of any other recess, is to be concealed or partially concealed, then the thickness of the fireproof covering shall be increased correspondingly.

Sec. 529. (Floor, Construction Of.—Hollow Tile Flooring.)—Brick, hollow, tile, porous terra cotta, or approved cement concrete, or approved cinder concrete, shall be used for the construction of floors and roofs of fireproof buildings. Flat arch hollow tile, or flat arch porous clay tile floor arches shall have a height of at least one and one-half inch for each foot of span.

Hollow tile flat arch floor construction having a thickness of only one and one-half inch for each foot of span shall be used only for the minimum floor loads, and the area of burnt clay in the flanges and ribs, and webs of the hollow burnt clay tiles shall be proportioned to the safe value of resistance to compression of the materials used in the most stressed areas of the burnt clay.

Sec. 530. (Segmental Arches.)—Segmental arches shall have a rise of at least one inch for each foot of span of arch.

The least thickness of a hollow tile or porous terra cotta segmental arch shall be one-half of an inch per foot of span, but no such hollow tile or terra cotta arch shall be of a thickness less than five inches.

Both flat and segmental arches shall be so constructed that the joints of the same radiate from a common center and there shall be a cross rib for every four inches, or fractional part thereof, in height in each tile block. The skew back of the arches shall be carefully fitted to the beams supporting them, and in addition to the cross ribs there shall also be additional diagonal reinforcing ribs in the skew back. Such arches, whether flat or curved, shall have their beds well filled with cement mortar, and the centers shall not be struck until the mortar has set.

Burnt clay skew backs shall be molded in such a manner as to support the burnt clay covering on the under sides of beams or girders.

Sec. 531. (Floors, Wood Surfacing and Nailing Strips.)—Wood floor surfacing and wooden nailing strips for such wood floor surfacing may be used in fireproof buildings.

Where wood flooring is used in a fireproof building, the space immediately under such wood flooring, and between the wood nailing strips and under such wood nailing strips, shall be filled with a cement or a cinder concrete tamped into place in an unset state, or such other incombustible material as shall be approved by the Commissioner of Buildings.

Sec. 532. (Partitions in Fireproof Buildings.)—The partitions around stairs, stair halls, shafts, elevators or public lavatories shall be fireproof partitions, as described in Section 533 of this chapter; all other partitions in fireproof buildings shall be incombustible partitions. Where blocks are used for building partitions or as enclosing walls the joints shall be well filled with mortar.

The partitions shall be wedged tight between floors and ceilings with incombustible wedges.

Sec. 533. (Partitions, Fireproof.—Incombustible.)—Only fireproof material shall be used for fireproof partitions; if of brick, they shall be not less than four inches thick, and if of partition blocks, not less than three inches thick. If fireproof partitions are of reinforced concrete they shall be not less than two inches thick.

All fireproof partitions shall be supported directly by the steel construction, or by the fireproof floor arches, or stone concrete, or brick. No cinder concrete or wood flooring shall intervene between any such partition and its support.

All doors, windows, sashes, frames, casings and glass in fireproof partitions shall be built as required in Section 525 of this chapter.

Only fireproof or incombustible material shall be used in the construction of incombustible partitions, excepting that frames, casings, doors, sash and the rough carpenter work required for the proper fastenings of such frames, casings, doors or sash, may be of wood, and that ordinary glass may be used in doors and partition windows.

Sec. 534. (Stairs, Landings.)—Stairs in fireproof buildings shall be built of approved cement concrete, reinforced concrete, stone or with metal supports, metal strings, metal treads, metal platforms, or a combination of one or more of such materials.

If reinforced concrete is used in the construction of any stairs in a fireproof building, such stairs shall be designed according to the provisions of the sections applying to reinforced concrete.

Stairs shall carry a live load of not less than one hundred pounds per square foot on treads and landings, and every part of a stair shall be so designed that the safe limit of fiber stress is not exceeded.

The hand rails of such stairways may be of wood, all other material in such stairways in fireproof buildings shall be "fireproofed," or "incombustible" material, except cinder concrete.

If stairs are constructed of solid concrete, having the tread and riser in one piece, then there shall be not less than forty-five square inches of concrete in the cross section of such combined tread and riser, and such stairs shall have reinforced concrete or metal outer strings.

If stone treads or platforms are used they shall have a metal sub-tread, or sub-platform, of the same weight as if the metal alone were used.

If platforms have a floor arch sub-construction as described in Section 529 of this chapter, then the metal sub-platform may be omitted.

Sec. 535. (Painting.)—All structural metal which is used in a fireproof building, or which is used in any foundation, or which is used in reinforced concrete work, shall be clean and free of rust, or scale at the time of the enclosure or covering of such metal. All metal which is not to be fireproofed shall have two coats of first-class metal protecting paint.

Sec. 536. (Rivets, Machine Driven.)—All structural steel and iron work shall be so riveted that the distance from the center of the rivet hole to the edge of the materials shall be not less than:

⅝ inch for ½-inch rivets.
⅞ inch for ⅝-inch rivets.
1⅛ inches for ¾-inch rivets.
1⅜ inches for ⅞-inch rivets.

Wherever possible, however, the distance from the rivet hole to the edge of the material shall be equal to two diameters of such rivet hole. All rivets, wherever practicable, shall be machine driven; the rivets in connection shall be proportioned and placed to suit the stresses, and the pitch of rivets shall never be less than three diameters of the rivets nor more than six inches. All holes shall be punched accurately, so that upon assembling a cold rivet will enter the hole without straining the material by drifting. The rivets shall fill the holes completely, and, whenever necessary, gussets shall be provided of thickness and size to accommodate the number of rivets necessary to make a connection.

Sec. 537. (Truss Designs to Be Submitted.)—When steel or iron trusses are used the trusses shall be of such design that the stress in each member may be calculated and all trusses when placed shall be held rigidly in position by an efficient system of lateral and sway bracing, and any member of a truss subjected to transverse stress in addition to direct tension or compression shall have the stress causing such strain added to the direct stresses coming on the member, and the total stresses shall in no case exceed the stresses provided for in Section 594 of this chapter.

Sec. 538. (Trusses to Be Inspected.)—On all buildings in process of construction, where the plans call for the use of trusses, or iron and steel structural work, the erection of such iron and steel structural work and of such trusses shall be inspected thoroughly by an inspector from the Building Department of the city, and such inspector shall be a man well versed in the design and construction of structural steel and iron work, and it shall be the duty of such inspector to see that the provisions of this chapter are strictly complied with, and such inspector shall have the authority to compel the contractors and builders to use a sufficient amount of temporary bracing or guys necessary to insure the safety of the work during its erection and to compel such contractors and builders to keep all derricks, tackles and hoisting appliances used in such work in a safe condition and to enforce all the provisions of this chapter.

Sec. 539. (Bolts to Be Turned and Holes to Be Reamed.)—Wherever it is found impossible to rivet connections as herein described and such connections are bolted, the bolts shall be turned and the holes reamed so as to get a perfect fit.

All structural members which are temporarily bolted together shall be well bolted in every alternate hole.

Sec. 540. (Fireproof Buildings, Height Of.)—The height of a fireproof building shall be measured from the average inside grade line of the street frontage of the building to the top of the highest point of the external bearing walls. Roof houses for elevators, or tanks, or skylights, or stairs, or scuttles may be built above the height of the main roof, and no building shall be erected in the city of greater height than two hundred and sixty feet.

Sec. 541. (Roofs, Rise of Roof Above Limit of Height.)—In the case of buildings which are entirely fireproof in their construction, and of which the roof is also entirely of fireproof construction, the roof may rise above the limit of height of wall fixed by this chapter for such buildings at a slope not to exceed thirty degrees with the horizon, and to a height not exceeding twenty feet above such limitation of the height of such wall. The space enclosed by such roof above the limitation of the height of such wall may be used as an enclosure for pipes, ventilating or elevator machinery or for ventilating ducts, but it shall not be lawful to use such space for purposes of storage, business or residence.

Sec. 542. (Sheet Metal Work, Support Of.)—Wood shall not be used as the support of any sheet metal work or of any gutter or cornice of a building more than one hundred feet in height.

Sec. 543. (Reinforced Concrete.—Regulations in Regard to the Use of.)—The term "reinforced concrete," as used in this chapter, shall be understood to mean an approved concrete mixture reinforced by steel of any shape, so combined that the steel will take up the tensional stresses and assist in the resistance to shear.

Sec. 544. (Stress.)—Reinforced concrete construction shall be of such nature that the stresses can be calculated according to the accepted formulas of modern concrete engineering practice.

Sec. 545. (Permission to Erect.)—Before permission to erect any reinforced concrete structure is issued, complete drawings and specifications shall be filed with the

Commissioner of Buildings, showing all details of the construction, the size and position of all reinforcing rods, stirrups, etc., and giving the composition of the concrete.

Sec. 546. **(Concrete.—Mixing Of.—Method of Testing.)**—The concrete shall be mixed in the proportions of one of cement, three of sand and five of stone, gravel or slag. The proportions shall be such that the resistance of the concrete to crushing shall not be less than two thousand pounds per square inch after hardening for twenty-eight days. The tests to determine this value shall be made by a competent engineer under the direction of the Commissioner of Buildings. The concrete used in reinforced concrete construction shall be what is usually known as a wet mixture.

Sec. 547. **(Cements.—Method of Testing.)**—Only high-grade Portland cements shall be used in reinforced concrete construction. Such cements, when tested neat, shall, after one day in air, develop a tensile strength of at least two hundred pounds per square inch; and after one day in air and six days in water shall develop a tensile strength of at least five hundred pounds per square inch; and after one day in air and twenty-seven days in water shall develop a tensile strength of at least six hundred pounds per square inch. Other tests as to fineness, constancy of volume, etc., made in accordance with the standard method prescribed by the American Society of Civil Engineers' Committee, may from time to time be prescribed by the Commissioner of Buildings.

Sec. 548. **(Sand.—Stone, Crushed Slag or Gravel.—Steel.)**—The sand to be used in such concrete shall be clean, sharp torpedo sand, free from loam or dirt.

The stone used in such concrete shall be clean, crushed stone or gravel, or crushed blast furnace slag of a size that will pass through a three-quarter-inch ring. The stone shall be fresh broken and the gravel shall be thoroughly washed.

The steel used shall be calculated according to its elastic limit; for moving or vibrating loads a steel of a lower elastic limit than is used for quiescent loads shall be used.

Sec. 549. **(Reinforcing.—Method Of.)**—All reinforcing steel shall be completely enclosed by the concrete, and such steel shall nowhere be nearer to the surface of the concrete than the diameter of such reinforcing steel bar, or rod or other shape. The steel in beams or girders shall be so disposed that there shall be not less than one and one-half times the thickness of the steel in concrete between the steel, and where more than two bars are used the bars shall be placed in two or more planes.

Reinforced concrete shall be so designed that the stresses in the concrete and the steel shall not exceed the following limits: Extreme fiber stress on concrete in compression, five hundred pounds per square inch; shearing stress in concrete, seventy-five pounds per square inch; concrete in direct compression, three hundred and fifty pounds per square inch; tensile stress in steel, one-third of the elastic limit; shearing stress in steel, ten thousand pounds per square inch.

The adhesion of concrete to steel shall be assumed to be seventy-five pounds per square inch of surface where bars are three-quarters of an inch or less in diameter and proportionately less for bars of a diameter greater than three-quarters of an inch.

The ratio of the moduli of elasticity of concrete and steel shall be taken as one to twelve.

The following assumption shall guide in the determination of the bending moments due to external forces: Beams and girders shall be considered as simply supported at the ends, no allowance being made for continuous construction over supports. Floor plates, when constructed continuous and when provided with reinforcement at top of plate over the supports, may be treated as continuous beams, the bending moment for uniformly distributed loads being taken at not less than W. L. divided by eight; the bending moment may be taken at W. L. divided by twenty in the case of square floor plates which are reinforced in both directions and supported on all sides. The floor plate to the extent of not more than five times the width of any beam or girder may be taken as part of that beam or girder in computing its moment of resistance.

The moment of resistance of any reinforced concrete construction under transverse loads shall be determined by formulas based on the following assumptions:

(a) The bond between the concrete and steel is sufficient to make the two materials act together as a homogeneous solid.

(b) The strain in any fiber is directly proportionate to the distance of that fiber from the neutral axis.

(c) The modulus of elasticity of the concrete remains constant within the limits of the working stresses fixed in this chapter.

From these assumptions it follows that the stress in any fiber is directly proportionate to the distance of that fiber from the neutral axis.

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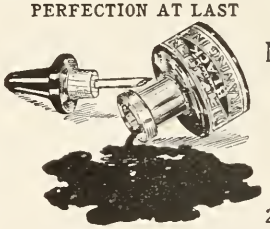
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The tensile strength of the concrete shall not be considered.

Sec. 550. (Construction.—Reinforced Concrete.)—Reinforced concrete construction shall be designed so that the shearing stresses, both vertical and horizontal, developed in any part of the construction, shall not exceed the safe working strength of the concrete as fixed in this chapter, or a sufficient amount of steel shall be introduced in such a position that the deficiency in the resistance to sheer is overcome.

When the safe limit of adhesion between the concrete and steel is exceeded, some provision shall be made for transmitting the strength of the steel to the concrete.

Sec. 551. (Columns.—Reinforced Concrete.)—Reinforced concrete may be used for columns when the ratio of length to the least side or diameter does not exceed twelve. The reinforcing rods shall be tied together at intervals of not more than the least side or diameter of the column, or spirally wound steel may be used.

When vertical reinforcing rods are used in columns, such rods shall have their ends milled normal to the longitudinal axis, and such rods shall have full perfect bearings at each joint, and such joints shall occur only at floors or other points of lateral support and a tight fitting sleeve shall be provided at all joints of vertical reinforcing rods.

Sec. 552. (Wind Pressure.)—In the case of buildings in which allowances must be made for wind pressure as provided in Section 603 of this chapter, the reinforcing rods of columns shall be connected and the milled end surfaces shall be brought together by threading the rods and by threaded sleeve nuts, or threaded turnbuckles, or methods equally effective and satisfactory to the Commissioner of Buildings.

Sec. 553. (Tests.—To Be Made by Contractor on Demand.)—The contractor shall be prepared to make load tests on any portion of a reinforced concrete construction within a reasonable time after erection, as often as may be required by the Commissioner of Buildings. Such tests shall show that the construction will sustain a load twice that for which it is designed, without any sign of failure, or in the case of beams, girders or floors, without deflecting more than one-seven-hundredths of the span.

Sec. 554. (Reinforced Concrete Walls.)—Buildings of Classes I., II., III., VI. and VII. having a complete skeleton construction of steel or of reinforced concrete construction or a combination of both, designed to safely resist all of the strains caused by the dead weights of the structure and of the live loads and of the wind pressure within the safe limits of stress provided in this chapter for each material used, may have walls of reinforced concrete six inches thick for the upper two stories and walls seven inches thick for the two stories next below the upper two stories, and walls eight inches thick for the stories next below the upper four stories, and walls nine inches thick for the stories next below the upper six stories, and so on downwards, increasing the thickness of the walls one inch for each two stories or part thereof. Provided, however, that such walls shall support only their own weight, and that such walls have steel rods three-quarters of an inch in diameter or of an equivalent area set vertically, and spaced not more than eighteen inches apart, and steel rods five-eighths of an inch in diameter or of an equivalent area set horizontally tied to the vertical rod at each intersection with these, and set not to exceed twenty-four inches apart; and provided that where the weight of the walls of each story is not transferred to the skeleton by spandril beams, the vertical reinforcement shall be increased in weight in an arithmetical ratio of twice as much steel in the two stories next below the upper two stories, and three times as much steel in the two stories next below the upper four stories, and so on downward. Vertical bars shall be spliced together by winding with iron wire. Horizontal bars shall be wired to the columns. Additional bars shall be set around openings, the verticals wired to the nearest horizontal bars and the horizontal bars at top and bottom of openings shall be wired to the nearest vertical bars.

The steel rods shall be combined with the concrete and placed where the combination will develop the greatest strength, and the rods shall be staggered or placed and secured to the steel or reinforced concrete structural skeleton of the building, so as to resist a pressure of fifty (50) pounds per square foot, either from the exterior or from the interior on each and every square foot of each wall panel.

Sec. 555. (Molded Hollow Concrete and Hollow Tile Block.)—Molded hollow concrete blocks or molded hollow vitrified clay building blocks of the full thickness of a ten-inch wall may be used wherever eight-inch walls are called for by this chapter, and such blocks may also be used wherever twelve-inch brick walls are called for in this chapter under frame cottages and in one and two story Class III. and Class VI. buildings.

ARTICLE XIII.

SLOW-BURNING CONSTRUCTION.

Sec. 556. **(Slow-Burning Construction Defined.)**—The term "slow-burning construction" shall apply to all buildings in which the structural members which carry the loads and strains which come upon the floors and roofs thereof are made wholly or in part of combustible material, but throughout which the structural metallic members shall be protected against injury from fire by coverings of incombustible, non-heat conducting material similar to those described under the head of "skeleton construction," except that plastering and metallic lath may be used as provided herein. In the case of columns the metallic lath shall be fastened to metallic furrings and the plastering upon the same shall be of three coats of mortar. The lower five (5) feet of each column shall be protected as required for brick, concrete or tile covering in Section 522 of this chapter. A covering of three (3) coats of plastering on metallic laths shall be considered sufficient protection for the under side of joists and girders and a layer of mortar or other incombustible material at least one and one-half inches thick shall be applied on all floors and roof surfaces above the joists of the same.

Sec. 557. **(Posts, Partitions and Elevator Enclosures.)**—Where oak posts of greater sectional area than one hundred square inches are used, they need not be covered. All partitions and all elevator enclosures in buildings of this type shall be made entirely of incombustible material. The use of wood furring or of stud partitions shall not be allowed in buildings of this type.

Sec. 558. **(Stairs.—To be Incombustible.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

Where buildings are required to be of "slow burning construction," all stairs in such building shall be of incombustible material; provided, however, said stairs may be of ordinary construction, if said building is equipped with an automatic sprinkler system, and stairs are enclosed in a fireproof wall.

ARTICLE XIV.

MILL CONSTRUCTION.

Sec. 559. **(Mill Construction Defined.)**—The term "mill construction" snall apply to all buildings in which all the girders and joists supporting floors and roof have a sectional area of not less than seventy-two square inches, and above the joists of which there is laid a timber floor not less than three and three-fourths inches thick. Wooden posts used in buildings of this type shall not be of smaller sectional area than one hundred square inches.

Sec. 560. **(Fireproofing.)**—Partitions and elevator enclosures in buildings of this type shall be made entirely of incombustible material. If iron columns, girders or beams are used in buildings of this type, they shall be protected as specified in this chapter, but the wooden posts, girders and joists need not be protected by fireproof covering. The use of wood furring, wood laths or stud partitions shall not be permitted in buildings of this type.

Sec. 561. **(Stairs.—To be Incombustible.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

Where buildings are required to be of "mill construction," all stairs in such buildings shall be of "incombustible" material; provided, however, said stairs may be of ordinary construction, if said building is equipped with an automatic sprinkler system and stairs are enclosed in a fireproof wall.

Sec. 562. **(Concrete Construction.—Approved Cinder.)**—The term "approved cinder concrete construction" shall apply to all buildings in which all parts that carry weights or resist strains, all exterior walls, all interior walls, all interior partitions, all stairs and all elevator enclosures are made entirely of incombustible material, and in which all metallic structural members are protected against the effects of fire by approved cinder concrete proportioned, mixed, applied and secured as herein described. Approved cinder concrete construction may be used for all buildings in which fireproof construction is mandatory by this chapter, or where ordinary construction may be used.

Approved cinder concrete shall consist of a standard Portland cement, torpedo sand, and clean, thoroughly burnt steam boiler cinders, free from deleterious matter, no particle of which shall be larger than one inch.

Sec. 563. **(Cinders.—Quantity.)**—The volumetric quantity of the cinders combined with the torpedo sand shall not exceed the volume of the Portland cement by more than eight (8) times. All of the ingredients of approved cinder concrete shall be thoroughly worked and wet so as to cover each piece of cinder with moistened cement; and the cement and sand shall fill all of the voids between the cinders.

All approved cinder concrete shall be cast and rammed in an unset condition against the metal.

The minimum thickness of approved cinder concrete covering in structural metal shall be two (2) inches. In every case the thickness of the coverings shall be measured from the extreme projection of the structural metal unless otherwise provided in this chapter.

Sec. 564. (Columns.—Approved Concrete.—Coverings.)—The approved cinder concrete covering of the columns shall be not less than three (3) inches in thickness from the extreme projection of the metal, including the plastering, and in all cases the cinder concrete shall be rammed solid against the column metal, filling all channels and open spaces within the perimeter of the finished plaster column. Approved cinder concrete column covering shall have metal binders of No. 8 gauge wire imbedded in and around the columns for each sixteen (16) inches in height of the column, provided, however, that in buildings of approved cinder concrete construction the columns may be covered with one thickness of metal furring, metal lathing and not less than three coats of mortar.

In places where there is trucking or wheeling, or handling of packages of any kind, the lower five (5) feet of every column shall be incased in a protective covering such as is described in Section 522 of this chapter.

Sec. 565. (Beams and Girders.—Approved Cinder Concrete Construction.)—The beams and girders of a building built of approved cinder concrete construction shall be enclosed in approved cinder concrete which shall be not less than two (2) inches in thickness at any and all points of the structural metal work. The approved cinder concrete covering shall be reinforced with metal clips or wire binders, either or both of which shall not be more than sixteen (16) inches on centers in the direction of the length of the structural member.

The top of all girders or beams shall be protected with not less than two (2) inches of approved cinder concrete.

A floor or roof construction of approved cinder concrete may be used for any span between structural members that will carry the test loads required by this chapter for such floors and roofs.

Sec. 566. (Segmental Arches.)—Segmental arches shall be not less than three (3) inches in thickness at the crown.

Sec. 567. (Floors.—Flat Slab Construction.)—Flat slab floor construction shall be not less than four (4) inches in thickness for spans of eight (8) feet or less. Flat slab floor construction shall be not less than five (5) inches in thickness for spans between eight (8) and ten (10) feet.

Approved cinder concrete shall not be used as a floor or roof construction unless such approved cinder concrete is reinforced by steel or iron, and such reinforcement shall not weigh less than three-quarters of a pound per square foot of superficial surface.

All reinforcing steel shall be completely enclosed by the concrete.

Wood nailing strips for floor surfacing may be used in buildings of approved cinder concrete construction, provided, however, that such nailing strips shall be imbedded as described in Section 531 of this chapter.

Sec. 568. (Partitions.)—The partitions in buildings of approved cinder concrete construction shall be as described in Section 532 of this chapter for partitions in fireproof buildings, provided, however, that partitions may be built wholly of metal studding, metal lath and plaster, but no such partitions shall be of a less thickness than one and one-half (1½) inch.

The partitions around stairs, or stair halls, or shafts, or elevators, or public lavatories, shall be wedged tight between the structure of the floors and ceilings, or if such partitions are of plaster, the metal or metal studding shall be secured to the structure by clips, bolts or other metal fastening, and in no case shall any such partition be built on the wood flooring or wood nailing strips.

Sec. 569. (Walls.—Enclosing.)—The enclosing walls, the covering of exterior side of mullions, beams, girders, lintels, the enclosures of pipes, pipe shafts, the doors into shafts, windows into shafts, covering of girders, covering of trusses, cut-out boxes, chases, stairs, landings, painting, rivets, bolts, and all other items required in these sections on fireproof construction and in the sections on skeleton construction shall, in buildings of approved cinder concrete construction be designed or built or covered, or made of the material called for, or any one or a number of these requirements, as described in such sections describing the requirements of skeleton construction or of fireproof construction in this chapter, provided, however, that approved cinder concrete as described herein may be used for all protective covering of structural metal.

ARTICLE XV.

ORDINARY CONSTRUCTION.

Sec. 570. (Ordinary Construction Defined.)—The term "ordinary construction," as used in this chapter, means the ordinary system of construction in which timber and iron structural parts are not protected with fire resisting coverings.

ARTICLE XVI.

GENERAL CONSTRUCTION REQUIREMENTS.

Sec. 571. (Construction or Alteration of Buildings.)—Every building or structure, or part thereof, hereafter constructed, erected, altered, enlarged or changed anywhere within the city, shall be so constructed, erected, altered, enlarged or changed only in accordance with the provisions of this chapter.

Sec. 572. (Materials.)—Materials used in the construction of buildings of all classes shall conform to the following specifications:

Sec. 573. (Foundation Proportions.)—Foundations shall be proportioned to the actual average loads they will have to carry in the completed and occupied building.

Sec. 574. (Foundation Construction.)—Foundations shall be constructed of either of the following: Approved cement concrete, dimension or rubble stone, sewer or paving bricks or iron or steel or piles. If iron or steel is used the filling and the coating of the same shall be of Portland cement as provided in Section 583 of this chapter, piles shall be covered with grillage of timber, concrete or steel, or a combination of these. Where timber grillage or timber piles are used, the top of such grillage or such piles shall be at least one foot below city datum.

Sec. 575. (Foundation of New and Old Walls.)—In all cases where there is an increase in the thickness of walls, a new foundation shall be built in such manner as to carry jointly both the new and old walls, and the soil under such foundations shall not be loaded beyond the limits hereinbefore specified in this chapter. All foundations shall be protected against the effects of frost, and frozen cement mortar shall not be used in connection with building operations.

Sec. 576. (Foundations.—Pile Borings Required.—Safe Load Required.—Fiber Stress.)—Where pile foundations are used, auger borings of the soil shall first be made to determine the position of the underlying stratum of hard clay or rock, and the piles shall be made long enough to sustain the required load according to approved formulas for pile driving, and timber piles shall not be loaded more than twenty-five tons to each pile. The heads of the piles are to be protected against splitting while they are being driven, and after having been driven the piles are to be sawed off to a uniform level and covered with a grillage so proportioned that in the transmission of the load from the structure to the pile the extreme fiber stress of the grillage shall not exceed the safe limits for the respective materials as prescribed in this chapter. The safe compression load per square inch on concrete in concrete piles shall not exceed four hundred pounds. The area of the cross section shall be measured at a point six (6) feet below the head of the pile after the same has been set in place, and the cross section of the pile above this point shall not be reduced.

Sec. 577. (Foundations Other than Pile.)—If foundations of other materials than piles are used, they shall be so proportioned that the loads upon the soil shall not exceed the limits for different kinds of soil than those hereafter given, to-wit:

Sec. 578. (Load for Various Soils.)—If the soil is a layer of pure clay at least fifteen feet thick, without admixture of any foreign substance excepting gravel, it shall not be loaded more than at the rate of three thousand five hundred pounds per square foot. If the soil is a layer of pure clay at least fifteen feet thick, and is dry and thoroughly compressed, it may be loaded not to exceed the rate of four thousand five hundred pounds per square foot.

If the soil is a layer of dry sand fifteen feet or more in thickness, and without admixture of clay, loam or other foreign substance, it shall not be loaded more than at the rate of four thousand pounds per square foot.

If the soil is a mixture of clay and sand it shall not be loaded more than at the rate of three thousand pounds per square foot.

Sec. 579. (Foundations in Wet Soil. —Trenches to Be Drained.)—In all cases where foundations are built in wet soil, it shall be unlawful to build the same unless the trenches in which the work is being executed are kept free from water by bailing, pumping or otherwise, until after the completion of work upon the foundations, and in each case a connection with the street sewer shall be established before beginning the work of laying foundations.

Sec. 580. (Foundations.—Where Not Permitted.)—Foundations shall not be laid on filled or made ground or on loam, or on any soil containing admixture of organic matter.

Sec. 581. (Foundations.—Depth Below Surface.—Least Limit.—Depth Regulated by Sewer.—Exceptions.)—Foundations shall in all cases extend at least four feet below the surface of the ground upon which they are built, and in the case of all buildings forty feet or more in height, foundations shall extend at least to the depth drained by the street sewer in the neighboring streets or alleys; but if such sewers are at a greater depth than ten feet below the sidewalk grade, such foundations need not extend to a greater depth than ten feet, provided that sound, hard soil is found at that depth.

Sec. 582. (Concrete.—Broken Stone.—Sand.—Cement.—Mortar.—Foundations Of.)—Broken stone or concrete in making foundations shall be clean and free from dirt and dust. And sand shall be free from admixture of loam and shall be otherwise clean and sharp.

Cement shall have been kept dry and shall be used fresh from the package; cement which has been permitted to become wet, hard or lumpy before it is mixed into the mortar or concrete shall not be used.

The use of concrete or mortar of any kind, the ingredients of which are not thoroughly and completely mixed and which are not free from lumps, or other unmixed portions of any of the ingredients, is prohibited; and also the use of cement mortar which has become partly or wholly set before use. Concrete foundations wherever used shall have boxes of plank all around them, and the concrete shall be well rammed in individual layers not more than six inches each in thickness. The ramming shall be continued until the water stands on the top of the mass of concrete.

Sec. 583. (Steel Rails or Beams in Concrete.)—If steel or iron rails or beams are used as parts of foundations, they shall be thoroughly imbedded in a concrete, the ingredients of which shall be such that after proper ramming the interior of the mass will be free from cavities, the beams or rails shall be entirely enveloped in concrete, and around the exposed external surfaces of such concrete foundations there shall be a coating of a standard cement concrete not less than four inches thick.

Sec. 584. (Concrete Foundations.—Steps.—Safe Load Where Reinforced by Beams.)—If concrete foundations are used by themselves and without the insertion of iron or steel beams or rails, the offset on top of same shall not be more than two-thirds the height of the respective courses, and such concrete foundations shall not be loaded more than twenty-five thousand pounds per square foot. If reinforced by iron or steel beams or rails, the loads and offsets in the same shall be so adjusted that the fiber stress upon the metal, if iron, shall not exceed twelve thousand pounds per square inch, or, if steel, that the fiber stress shall not exceed sixteen thousand pounds per square inch.

Sec. 585. (Dimension Stones.—Safe Load.)—Dimension stones shall have uniform beds and the offsets in the same, where two or more layers are used, shall not be more than three-quarters of the height of the individual stones. They shall be set with full beds of cement mortar under their entire area, and in such manner that they will not rock after being set. Dimension stones in foundations shall not be subjected to a load of more than twenty thousand pounds per square foot in tiers.

If the beds of the stones are dressed and leveled off to a uniform surface and the stones are set in a standard cement mortar, this strain may be increased to twenty-five thousand pounds per square foot.

Sec. 586. (Rubble Stone.)—Rubble foundations and rubble walls shall be built of approximately square and flat bedded stones, well and thoroughly bonded in both directions of the walls, each stone thoroughly bedded in mortar under its entire area. Wherever walls of any kind are used as curb walls, their exterior surfaces shall be rendered approximately water tight by a coating of a standard cement mortar.

Sec. 587. (Brick.—Soft.—Use Of.—Bond.—Safe Load.)—The use of soft bricks is prohibited in all parts of buildings exposed to the weather and in internal or external piers or bearing walls. The bond of brick work shall be formed by laying one course of headers for every five courses of stretchers. Brick work in walls laid in a standard Portland cement mortar shall not be loaded more than twenty-five thousand pounds per square foot. Brick work laid in an ordinary cement mortar shall not be loaded more than eighteen thousand pounds per square foot. Brick work in walls laid in lime mortar shall not be loaded more than thirteen thousand pounds per square foot.

Sec. 588. (Walls.—Ledges.—Joists Supports.—Walls Around Stairs, Elevators and Shafts.)—Whenever walls sixteen inches or less in thickness shall be used for the support of ordinary joists in buildings of all classes, ledges of the thickness of the furring, lath and plaster shall be formed between such joists and shall be carried up and leveled off on the line of the tops of the joists, or standard cast iron joist boxes shall be used for the support of such joists.

Where a stairway or an elevator shaft or an air shaft is surrounded by brick walls, such surrounding brick walls may be built sixteen (16) inches thick, excepting that the upper fifty (50) feet of the height may be built twelve (12) inches thick, but the length or breadth, or either, of such a stairway or elevator shaft or air shaft shall not exceed twenty-five (25) feet, and in no case shall the load on the brick of such wall or walls exceed the safe limits of load specified for brick work in this chapter.

Sec. 589. (Pressed Brick Facing.—Bond Joints.)—If pressed brick facings are used, they shall be bonded into their backing every seventh course. Bond shall be established by solid headers or by blind headers. In the case of piers faced with pressed brick, only solid headers shall be used, but bond stones or iron bond plates may be substituted for such headers. Pressed brick in all cases shall be so laid as to have a full bed of mortar under its entire surface. The laying of pressed brick merely with a joint all around the outer edge of the bricks shall be unlawful.

Sec. 590. (Brick Piers.—Offsets.—Bond Stone.—Cap Stone.)—In building brick piers there shall be provided at every offset in each pier, or at every point where such brick pier receives the load, a bond stone at least eight inches thick or a plate of rolled iron or steel not less than one-fourth of an inch in thickness, which stones or plates, if at the top of such pier, shall cover its entire surface, and shall in all cases be adapted to receiving the load to be imposed and shall be made of a strength which will keep the fiber strain upon the material used within the limits elsewhere herein stated.

Sec. 591. (Stone Facing Without Bond Courses.)—Stone may be used as facing for brick walls under the following conditions: If the facing is ashlar, without bond courses, and the individual course thereof measure in height between bond stones more than six times the thickness of the ashlar, then each piece of ashlar facing shall be united to the brick work with wrought iron anchors at least two to each piece and reaching at least eight inches over the brick wall, and hooked into the stone facing as well as the brick backing. Wherever ashlar as before described is used, it shall not be counted as forming part of the bearing surface of the wall, and the brick backing shall be of the thickness of wall herein specified for the different kinds of building.

Sec. 592. (Stone Facing with Bond Courses.)—If stone facing is used with bond courses at a distance apart of not more than four times the thickness of the ashlar, and where the width of bearing of the bond courses upon the backing of such ashlar is at least twice the thickness of the ashlar, and in no case less than eight inches, then such ashlar facing shall be counted as forming part of the wall and the total thickness of wall and facing shall not be required to be more than herein specified for walls of the different classes of buildings.

Sec. 593. (Stresses.—Cast Iron.—Fiber.—Strains.—Length.)—The stresses in materials used in construction produced by the calculated strains due to their own weight and applied loads shall in no case exceed the following:

CAST IRON.

Extreme fiber strain tension	2,500 lbs.
For columns	10,000 lbs.

Reduced by Gordon's formula. Reduced for eccentric load.

No cast iron column shall have a length to exceed twenty-four times its diameter, or least side.

Sec. 594. STRESSES IN POUNDS PER SQUARE INCH.

	Wrought Iron.	Steel.
Extreme fiber stresses, "I" beams and shapes	12,000	16,000
Extreme fiber stresses, built beams	10,000	15,000
Tension	12,000	15,000
Shearing	7,500	10,000
Direct bearing pins and rivets	15,000	20,000
Bending on pins	18,000	22,500
*For columns and compression members	12,000	15,000

*Reduced for ratio of length of columns to its least radius of gyration by approved modern formulas, and reduced for eccentric loading.

Sec. 595. TIMBER—STRESSES IN POUNDS PER SQUARE INCH.

	On Extreme Fiber	Shearing Along Grain	Compression Perpendicular to Grain
White Pine and Spruce	750	80	150
White Oak	1,000	150	250
Long-leaved Yellow Pine	1,250	100	250

Sec. 596. (Posts with Flat Ends.—Stresses per Square Inch.)—
L. Length of posts in inches.
D. Least side or diameter of post in inches.
S. Stress per square inch.

White Pine Spruce.		L. L. Yellow Pine.		White Oak.
L. D.	S.	L. D.	S.	S.
0-10	625	0-15	1,000	750
10-35	475	15-30	875	650
35-45	375	30-40	750	560
45-50	300	40-45	625	460
		45-50	500	375

GENERAL PROVISIONS.

Sec. 597. (Walls.—Eight-Inch Brick Wall.—Height Limited.)—In no case, in any class of building, shall any eight-inch brick wall be more than fourteen feet in height.

Sec. 598. (Cement Concrete Walls.—Solid.)—Approved cement concrete of the same thickness as is required where common brick or rubble stone is used, may be substituted for either of these materials wherever either is called for in this chapter.

Sec. 599. (Walls.—Thickness Of.)—The thickness of walls set forth in the tables for the various classes of building shall, for each class of buildings, apply to all external enclosing walls, and also to such internal walls as may be required under the specifications of the different classes of buildings.

Sec. 600. (Bay Windows and Light Shafts.—Material For.)—Bay or oriel windows and light shafts may be built of combustible material, as specified in Section 287 of this ordinance.

Sec. 601. (Buildings.—Height Of.)—The limits of heights of buildings hereinbefore given for non-fireproof buildings, shall be from the average established sidewalk level to the highest point of roof thereof.

No buildings shall be erected in the city of greater height than two hundred and sixty feet from the sidewalk level to the highest point of external bearing walls. The erection of parapet walls or of balustrades constructed entirely of incombustible material is permitted above the roof level of buildings of all classes, and in addition to the heights herein fixed for the same. (See Sections 540 and 541.)

Sec. 602. (Floor Areas.—Computation Of.—For All Classes of Buildings.)—Stairs in Common.)—The floor areas of all buildings shall be computed from the dimensions taken on the inner side of the exterior or surrounding walls on the floor of the third story, and the areas of courts, of elevator shafts, of enclosed stairs, if enclosed with incombustible materials, and of chimneys, shall not be considered as a part of such floor areas.

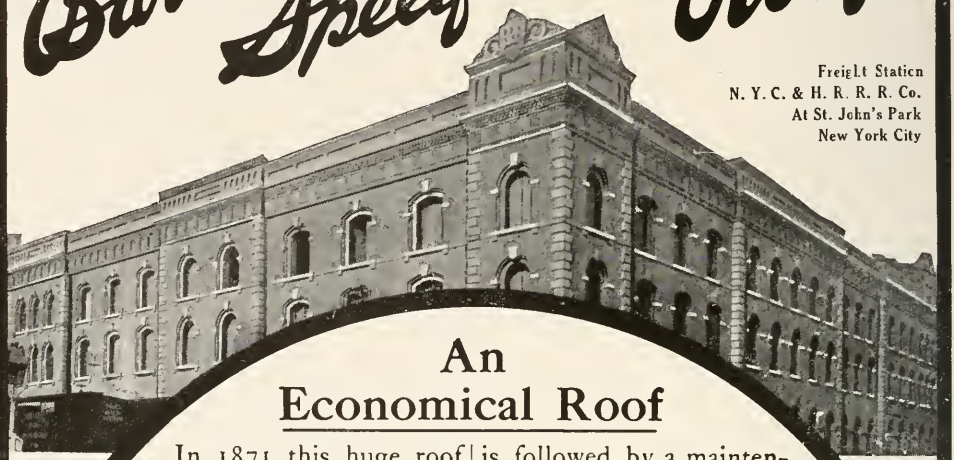
Where two areas of the same building adjoin, and are separated by fireproof dividing walls, they may have a stairway in common. Provided, however, in fireproof buildings such stairways shall be of incombustible material, enclosed in fireproof partitions, and access to such stairway shall be direct from each such area. Provided, however, in buildings of mill, slow-burning or ordinary construction, such stairways shall be of incombustible materials, enclosed by brick walls, and that doors to such stairways shall be automatic, self-closing standard iron doors, as described in Section 260 of this chapter, and all materials inside of such brick walls shall be fireproof or incombustible material.

Sec. 603. (Wind Pressure.—Precautions Against.)—In the case of all buildings the height of which is more than one and one-half times their least horizontal dimension, allowances shall be made in both vertical and horizontal construction for wind pressure, which shall not be figured at less than thirty pounds for each square foot of external wall surface.

Sec. 604. Basement.—Meaning Of.—Cellar.—Meaning Of.)—Wherever in this chapter the words "basement story" are used, it is intended to mean that the floor of such story is at a distance of two feet or more below the level of the sidewalk, and that its height does not exceed eleven feet in the clear. If the floor of such story is nearer than two feet to the sidewalk grade, or if the ceiling of such basement is more than nine feet above the sidewalk grade, it shall be counted as the first story of the building in which it occurs, except in buildings of Class VI. and Class VIII. as defined in Sections 246 and 248 of this chapter.

"Cellar" is a story, the height of which is more than two-thirds below the level of the grade at the building.

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Sec. 605. (Sub-Basements and Cellars.—Construction Of.)—No building may have more than one basement or cellar of ordinary or slow-burning or mill construction, all additional basements or cellars shall be of fireproof construction, as described in this chapter, all elevator enclosures shall be of brick from the lowest basement floor level to the first story floor, and all stairways shall be enclosed in fireproof partitions from the lowest basement floor level to the first story floor level with automatic closing standard iron doors, opening outwards.

In cases where a pipe, conduit, dumb-waiter, cable, wire, conveyor or belt, or any combination thereof passes from one basement to another through a floor the opening in the floor shall be enclosed as specified in Sections 524 and 525 of this chapter.

The number and width of stairs from the lowest basement floor to the first story shall be the same as required for the four highest stories of a building of the same area.

Sec. 606. (Enclosures Upon Roofs.—Parapets and Balustrades Upon Roofs.)—It shall be permitted to erect on the roofs of all buildings more than sixty feet and less than one hundred feet high, skylights, enclosures for water tanks and enclosures for elevator machinery, the construction of all of which enclosures shall be entirely of incombustible material; provided, however, that the roofs of same may be built of mill or slow-burning construction.

Sec. 607. (Fire Walls.—When Dispensed With.)—Fire walls of brick not less than twelve inches thick shall be built extending above the roofs of buildings if such roofs are flat, and also above the roofs of all buildings where the same abut against another building, or where the same stand upon any line of any lot, excepting street or alley lines. Provided, that where eight-inch walls are permitted in the top story of buildings, or as provided in Classes III. and VI. for buildings not over three stories high, the fire walls shall be of the same thickness. Such fire walls, where they stand upon lot lines, or where they are over the dividing walls in the interiors of buildings where such are called for by this chapter, by reason of the great area of such buildings, shall extend at least three feet above the roofs of such buildings. Fire walls upon street and alley lines shall extend not less than eighteen inches above the roofs of such buildings. Fire walls may be dispensed with on street and alley lines if the tops of the roof boards and roof joists are protected against fire for a distance of at least five feet from such street or alley lines by a coating of deafening mortar on hollow tile or porous tile at least two inches thick. Fire walls at street and alley lines may also be dispensed with in all cases where the entire framing and materials of the roof shall be made strictly fireproof.

Walls facing upon courts and light shafts shall be treated as in the same category with walls facing upon streets and alleys.

Fire walls shall be covered with a weatherproof coping of incombustible material.

Sec. 608. (Window and Door Sills.—Columns and Lintels Supporting Store Fronts. —Incombustible.)—Window and door sills shall be made of incombustible material. Oak timber used for door sills and not less than eight inches thick by the full width of the wall in which such sills occur, shall, for the purpose of this chapter, be counted incombustible, but no other form or use of wood construction shall be considered incombustible.

The columns and lintels supporting store fronts in buildings within the fire limits of more than one story in height shall be made of incombustible material.

Sec. 609. (Roofs.—Shingle or Gravel.)—The use of single roofs or of other forms of combustible roof covering upon buildings erected or altered within the fire limits is prohibited. Provided, however, that shingle roofs may be placed on buildings not exceeding two stories in height and two thousand square feet in area, but the shingles used on such roofs shall first have been dipped in fire-resisting paint, such fire-resisting paint to be approved by the Commissioner of Buildings.

Roofs whose slope is not more than three inches per foot horizontal, and the covering of which is made with a composition of felt and gravel, shall be considered incombustible under the provisions of this chapter, and may be used upon buildings of all classes.

Sec. 610. (Roofs.—Construction of.—Pitch Of.—Strength Of.)—In the case of all buildings less than sixty feet in height, roofs having a slope of more than specified for composition roofs, may be made of timber and board construction, and shall be covered with incombustible material, except as provided in Section 609 of this chapter. The roofs upon buildings sixty or more feet and less than ninety feet high, and of greater slope than three inches to the foot and less slope than thirty degrees with the horizon, shall, if made of timber construction, have an incombustible covering upon the roof boards, which shall be made either of mortar or porous terra cotta or plaster boards, or other incombustible material, and which shall be at least two

inches thick. If this covering is made upon the roof boards, wooden strips shall be inserted and securely fastened to the wooden substructure at regular intervals between the incombustible covering, and a weatherproof covering of incombustible material.

The roofs of all buildings of every kind and class shall be designed and constructed in such a manner that they will bear a load in addition to the weight of their structure and covering of at least twenty-five pounds for each square foot of horizontal surface.

Sec. 611. **(Roofs.—Pipes Carrying Water From.)**—The water from all roofs shall be carried to the street sewers in metal conductor pipes, which shall be continually maintained in such condition that leaks therein will not cause the water to soak into the walls or any other part of the building.

Sec. 612. **(Cornices.—Gutters.—Eaves.—Parapets.—Bay Windows.)**—Where sheet metal cornices or external metal sheet gutters are used, their entire framework and covering shall be of metal, and the walls shall extend behind all such cornices or gutters along their entire height. All metal work in and about any cornice, gutter, eave or parapet, or in or about any bay, or oriel window, shall be supported by suitable brackets placed not more than four feet apart and firmly secured to the wall. Wood shall not be used as the support of any gutter or cornice for buildings of one hundred feet or more in height.

Sec. 613. **(Towers.—Domes and Spires.—Construction Of.)**—Towers, domes and spires may be built on top of the roofs of buildings, but shall not occupy more than one-fourth of the street frontage of any building. Such towers, domes or spires, if any part thereof is built to a height of more than sixty feet and less than ninety feet, shall be of slow-burning construction, and if of greater height than ninety feet above the sidewalk shall be of fireproof construction; and in all cases where the area of such spire, dome or tower exceeds one hundred square feet, its supports shall be carried down to the ground, and shall be, if the construction supported is more than sixty feet and less than ninety feet high, of slow-burning construction, and if more than ninety feet high, of fireproof construction.

Sec. 614. **(Skylights.—Construction Of.—Glass In.)**—Any skylight on the roof of any building, other than a frame building, shall have the sides, sashes and frames constructed of metal; or of wood, metal clad on all exterior surfaces.

The glass in all such skylights, except in buildings of Classes III. and VI. not exceeding three stories in height shall have at least six inches over same, a strong wire netting (wire not lighter than No. 8 and mesh not coarser than one and one-half inch by one and one-half inch), unless the glass contains a wire netting within itself.

Sec. 615. **(Porches.—Verandas.—Porticos.—Balconies.—Construction of Inside Fire Limits.)**—If verandas, porches or porticos are enclosed, the enclosing walls shall be made of incombustible material, the only exception being in case such porticos or verandas are to be made part of a storm house or of a storm door enclosure, which, however, shall in no case be more than twelve feet high, nor shall it occupy a greater frontage than two feet more than the width of the inner doors for which the storm doors are made.

Sec. 616.—**(Sidewalks.—Occupation of by Parts of Buildings.)**—The use of any part of the sidewalks for steps or for open areas is prohibited.

Sec. 617. **(Chimneys.—Walls Of.—Height Above Roof.)**—Amended June 5, 1906, to read as follows:

No chimney shall be built with less than four inches thick brick wall, and no chimney having a greater flue area than two hundred and sixty square inches shall have walls less than eight inches thick; provided that in all cases where chimneys are built with walls less than eight inches thick the same shall have flue liners of fire clay or terra cotta in their entire length. Except that where flues are to be used for gas grates or gas ranges, the flue lining may be omitted, but the inside of the flue shall be smoothly plastered. Chimneys that are built of fireproof composition composed of cinders, cement and burnt sand shall be no less than two and one-half (2½) inches thick, and perfectly smooth. Chimneys that are built of fireproof composition shall be built in two sections capable of being shoved into one another where it touches the roof; the flue hole of the base stone must be much larger than the lower part of the chimney, so that the said base stone incases the lower portion of the chimney, and both can move independent without cracking a joint in a section; there being an air space or a cooler between the flue hole of the base stone and the lower portion of the chimney. It is not necessary that this chimey should be lined with fire clay or terra cotta, as it is itself a fireproof composition. The use of unprotected metal flues inside of buildings will not be permitted.

Every chimney having an area of not more than two hundred and sixty square inches shall be carried up to at least five feet above the highest part of the roof of

the building of which such chimney is a part, if such roof is a flat roof. If the roof is a pitched roof the chimney shall be carried up at least two feet above the highest point of same.

Sec. 618. (Chimneys.—Interior.—Walls Of.)—Chimneys having a greater flue area than six hundred square inches shall, if built of brick, have surrounding walls of at least sixteen inches of brick work, and such walls shall be built hollow with at least four inches hollow space in such walls, at a height of fifty feet above smoke inlet the thickness of the surrounding brick work may be reduced to twelve inches, but in all cases the surrounding walls of chimneys of this or any other size shall be so proportioned that the brick work in same will not be subjected to a greater stress than elsewhere herein fixed as a maximum safe stress for brickwork. For chimneys having a greater flue area than one thousand six hundred square inches the thickness of walls shall be increased above the thickness above specified, four inches for each increase of one thousand square inches or fractional part thereof.

Sec. 619. (Chimneys or Flues.—Height above Roof.)—All flues having a greater area than two hundred and fifty square inches, and not more than six hundred square inches, shall be carried up at least twelve feet above the highest point of roof or building of which they form part; and all flues having a greater area than six hundred square inches and not more than nine hundred square inches, shall be carried up at least twenty feet above highest point of roof. All chimneys having a greater area than nine hundred square inches shall be carried to a height of at least twelve feet above any roof within a radius of sixty feet; provided that the top of the chimney shall be not less than twenty feet above the highest point of the roof of the building of which it forms a part.

Sec. 620. (Chimneys or Flues.—Linings Of.)—All flues having a greater area than four hundred square inches shall be lined on the inside with insulating material, which lining shall start at least two feet below the smoke inlet, and for flues having an area of from four hundred to six hundred square inches shall extend twelve feet above smoke inlet, and for all flues of more than six hundred square inches, and not more than one thousand six hundred square inches, shall extend twenty feet above smoke inlet, and for all flues having a greater area than one thousand six hundred square inches, shall extend at least thirty feet above smoke inlet. If an internal smoke pipe of metal is used, so much of the brick work as is inside of the insulating cavity of the stack may be omitted. Metal smoke-stacks shall, however, be lined with insulating material for at least thirty feet of their height.

If internal stacks in buildings be made of metal then they shall be entirely surrounded within the building with a fireproof material which shall thoroughly protect the building from fire, and there shall be an air space, not less than four inches in the smallest part between the fireproofing and the metal stack.

Sec. 621. (Chimneys.—Interior.—Framing Around.)—No joists or girders shall rest and be supported on the walls of any chimney, and the framing around chimneys of all kinds shall be so constructed that in no case will any joists or timbers be placed nearer than two inches from the outside face of walls of flues, and in no case shall the distance from the inside of any flue to any joists or timbers be less than seven inches.

The foregoing shall apply only to chimneys which are enclosed by, or form part of, the interior of any building.

Sec. 622. (Chimneys.—External.—Location Of.—Built of Iron or Steel.)—Chimneys may be built outside of the walls of existing buildings (but not in such manner as to encroach upon any street or alley), and shall be built as follows:

If at least one side of such chimney abuts entirely upon the wall of an existing building and the chimney is throughout its entire length securely and firmly anchored to the walls of such existing building, the wall of such chimney may be built of hollow tiles, in which case, however, it shall have a cast iron base, lined with fire brick, and extending to a height of at least ten feet above the street or alley grade.

Such external chimney may also be built of rolled steel or iron not less than one-fourth inch in thickness, and lined with insulating material, laid in fire clay, for at least thirty feet above street or alley grade, or it may be built throughout its entire height of cast iron, in which case the first ten feet above street or alley grade shall be lined with insulating material; provided, however, that in chimneys not exceeding five hundred square inches in flue area, the upper twenty-five feet may be constructed of steel or iron not less than one-eighth inch thick.

Sec. 623. (Chimneys.—Isolated.)—Isolated chimneys shall be so designed and constructed that the stress upon any part thereof, due from the weight of the stack itself and from wind pressure, shall never exceed the safe limits as provided in this chapter.

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Sec. 624. (Chimneys or Smokestacks.—Foundation Of.)—The foundations of chimneys or smoke-stacks, whether inside or outside of buildings, or whether connected with the same or isolated, shall be designed and built in conformity with the provisions relating to foundations of buildings hereinbefore given.

Sec. 625. (Smoke Flues Passing Through Partitions.—Woodwork Around.)—Where smoke flues of diameter of six inches or less pass horizontally through a wood or a plastered stud partition, they shall be surrounded by a ventilated thimble of incombustible material.

Where a smoke flue of a greater diameter than six (6) inches passes through a wood or plastered stud partition, it shall be surrounded either by a body of brick, hollow tile, porous terra cotta or other incombustible substance, measuring at least eight (8) inches all around such smoke flue. Smoke flues of less diameter than twelve inches shall be kept at least twelve inches distant from any combustible partition, ceiling or floor, and such woodwork immediately over and for a distance of two feet on each side of such smoke flue shall be covered with sheet metal or with porous terra cotta, hollow tile or with plaster.

Smoke flues of greater diameter than twelve inches and less area than six square feet, shall be kept at least twenty inches away from any woodwork, and such woodwork shall be protected as before specified for the smaller smoke flues to a distance of four feet on each side of such smoke flues.

Wherever smoke flues of larger area than six square feet are used they shall be kept at least three feet distant from any woodwork, and such woodwork for a distance of at least six feet on either side of such smoke flues shall be protected as before specified for smaller flues.

Sec. 626. (Floors.—Protection Of.—Around Boilers, Furnaces, Etc.)—Wherever steam boilers or furnaces or ovens, coffee roasters or other structures in which fires are maintained, are set inside of a building, or in a room with wooden floor or ceiling construction, the floor of the same shall be protected by a covering of brick or concrete not less than five inches thick set in mortar upon a continuous sheet metal bearing plate not less than three-sixteenths of an inch thick, all the joints of which are to be securely riveted, and the edges of which are to be turned up five inches all around. This foundation of sheet metal and brick and concrete shall extend under the whole of the fire box and ash pit of such steam boiler or furnace or other structure, and to a distance of not less than ten feet in front and at least four feet on the other three sides of same.

Sec. 627. (Ceiling.—Protection Of.—Around Boilers, Furnaces, Etc.)—The space between the tops of such steam boiler or furnaces and any wood ceiling construction shall in no case be less than three feet, unless such boiler be a low pressure boiler, in which case such space shall be not less than eighteen inches, and the under side of such wood ceiling construction shall in all cases be protected either by three coats of plastering or metallic lath or wire netting, or at least two inches of porous terra cotta plastered on the under side, or by a covering of hollow tile with two air spaces at least one-half inch each between the wood and the under surface thereof, which under surface shall also be covered with a heavy coat of plastering.

Sec. 628. (Boilers.—Location Of.—Permit For.)—In all cases boilers shall be so placed as to give ample room between any ceiling, wall or partition to connect or operate any valves or pipes or other connections used on such steam boilers, and in buildings of 4,000 or more square feet in area, the size, number and location shall be marked on the plans before a permit is issued by the Building Department.

Sec. 629. (Cupolas of Foundries.)—Cupolas of foundries shall extend at least ten feet above the highest point of any roof within a radius of forty feet of such cupola, and shall be covered on top with wire netting.

Sec 630. (Pipes for Distribution of Hot Air.—Registers.)—Where pipes are used for the distribution of hot air from a hot air furnace, such pipes shall be made of metal and shall be double. The space between the two metal pipes shall be at least one-half inch. Such pipes are to be made with air tight joints and to be securely fastened to the partitions through which they pass.

The openings in floors for hot air registers shall be surrounded with borders of incombustible material not less than two inches wide, and firmly and securely set in place. The register boxes shall be double, the distance between the two thicknesses of tin being at least one inch.

Sec. 631. (Pipes, Ducts and Registers.—Material For.)—Where the air conveyed through pipes is heated in an ordinary hot-air furnace, or in any other apparatus by direct contact of the air with a fire box, the material used for these double ducts, pipes and register boxes shall be bright tin, and the joints shall be double-

seamed, but not soldered. Where the air is heated by contact with hot water or steam pipes, any other sheet metal may be used for the pipes, and the use of double pipes is not obligatory.

Sec. 632. **(Doors and Windows.—When Required to Be Closed.—Fire Resisting Glass.)**—Wherever the distance between doors and windows in buildings of Classes I., II., IV., V., VII. and VIII., on opposite sides of alleys or courts shall be less than thirty feet, or wherever the distance between such doors and windows and any inside lot line of any lot upon which any such building is erected is less than fifteen feet, or wherever the distance between such doors and windows and the alley line (where the alley is less than thirty feet wide) is less than fifteen feet, such windows and the glazed portion of such doors shall be made of fire-resisting glass, set in frames of incombustible material.

Where the windows in buildings of Class I. on lot line courts are less than two feet from the lot line the sashes shall be stationary.

The provisions of this section shall not apply to frame buildings of any class.
As amended by ordinance of October 22, 1906.

This section shall not apply to buildings of Class I., one story in height and having a floor area of less than twelve hundred and fifty square feet, nor shall it apply to buildings of Class II., not more than two stories in height.
As amended by ordinance of February 18, 1907.

Sec. 633. **(Class of Building Not to Be Changed Without Conforming to Provisions of This Ordinance.)**—If buildings, the uses of which bring them within any of the classes mentioned in this chapter are to be applied to the uses of any other class for which a better system of construction is called for by this chapter, the construction and equipment of such buildings shall first be made to conform to the requirements of this chapter as specified for their intended use. And it shall be unlawful to apply any such building to a new or different use than that to which its structure and equipment adapts it under this chapter, unless the requirements of this chapter for such new or different use shall first have been complied with, and a permit for such alteration of use shall have been first obtained from the Commissioner of Buildings.

Sec. 634. **(Alteration of Existing Buildings.)**—Amended by ordinance Feb. 3, 1908, to read as follows:

Nothing in this chapter contained shall be considered as requiring alterations in the construction or equipment of buildings in existence at the time of the passage of this chapter, unless such buildings shall not have sufficient or adequate means of egress therefrom or ingress thereto by reason of insufficient or inadequate stairways, or stairways improperly located, or insufficient or inadequate elevators or elevator equipment, doors, fire-escapes, windows or other means of egress or ingress.

Whenever an Inspector of Buildings shall make a report to the Commissioner of Buildings that any such building has inadequate or insufficient means of egress therefrom or ingress thereto, as aforesaid, he shall notify the owner, agent, or person in possession, charge or control of such building of such fact and direct him forthwith to make such alterations and changes in the construction or equipment of such building as are necessary to be made in order to promote the safety of the occupants of such building, and of the person using the same, and of the public.

If, however, it is desired to enlarge, or in any manner materially modify the construction of any existing building, or to make change in its use or occupation which will transfer it from one class as recognized by this chapter to another class, then before such enlargement or structural change or modification of building is made, or before such change in its use or occupation may be made, the entire building shall be reconstructed or modified in such manner as to bring the same, when enlarged or altered, or when occupied for its new and different purposes, in accordance with the provisions of this chapter.

Sec. 635. **(Walls of Altered Buildings.—Increasing Thickness Of.)**—If the walls of a building are not of sufficient thickness to comply with the requirements of this chapter for an enlarged or modified building, then the thickness of the existing walls shall be increased by building alongside of them a new wall, which shall not, however, be less in any part thereof than twelve inches thick, and which shall be increased in thickness by four inches for at least every forty feet in the height of such wall. Such new wall shall be laid in Portland cement mortar and shall be anchored to the old wall (bonding with brick or masonry will not be considered as complying with this chapter); and if an increase in the height of the building is contemplated, the wall from the top of the old wall shall be built jointly upon the new and old walls. If solid masonry buttresses are introduced in connection with such thickening and strengthening of existing walls, the intervening wall may be reduced to eight inches in thickness, provided such buttresses are sufficient in number and in area to make the resultant structure of equal strength with the solid wall already specified. Provided, however, that steel or iron columns or beams

may be used instead of such new wall, such columns or beams to be bolted or bonded to the existing wall in a manner satisfactory to and approved by the Commissioner of Buildings.

Sec. 636. (Walls.—Party.)—The provisions of the preceding section shall also apply to all cases where existing party walls are to be joined to for the erection of new buildings. But in the case of party walls, which at the time of their erection were built in accordance with the terms of the city ordinances then in force, such walls, if sound and in good condition, may be used without increase of thickness for any building not higher than and of the same class as the building for which the original wall was built.

Sec. 637. (Walls.—Erection Of.—Walls and Skeleton Framework Securely Braced.)—In the erection of buildings of masonry construction, no wall shall be carried up at any time more than two stories above another wall of the same building. The walls and skeleton framework of all buildings shall be kept securely braced and otherwise protected against the effects of the weather during all building operations.

Sec. 638. (Tanks on Roofs.—Permits.—Fees.)—It shall be unlawful for any person to construct, maintain, or to allow or permit to remain, in or upon the roof of any building in the city, any water tank of a larger capacity than four hundred gallons, unless such tank shall rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron girders set on steel plates, which rest upon a good and sufficient foundation of solid brick or stone masonry, or upon iron or steel construction; provided, however, that no water tank of a capacity exceeding four hundred gallons shall be constructed in or upon any building *without first submitting to this department a complete set of plans, showing the construction in detail of the supports and foundation of the tank; said plans are to be approved by the Department of Buildings, and a permit is to be taken out by the contractor for the substructure, for which permit a fee of five* ($5) *dollars shall be charged.*

Amended Nov. 25, 1907.

Sec. 639. (Stairs and Fire Escapes.—Obstruction Of.)—It shall be unlawful under any circumstances to close up or obstruct during the occupation for business purposes of any building, the stairways or fire escapes or the approaches leading thereto, and no change in the position or construction of any such stairway or fire escape shall be made, unless the permission so to do of the Building Department first shall have been obtained.

ARTICLE XVII.

FRAME BUILDINGS.

Sec. 640. (Permits for Raising or Altering Buildings.—Requirements.)—Permits to alter or raise frame buildings shall be given, provided they do not involve an enlargement or raising of such buildings beyond the limits of dimensions herein prescribed for frame buildings, and if the stresses upon the material thereof are kept within the safe limit of stresses herein prescribed in this chapter, and if, further, such frame building has not been damaged to any extent greater than fifty per cent of its original value by fire, wear and tear, and action of the elements or otherwise. Provided, however, where any frame building is raised for the purpose of erecting a basement story under the same, the walls inclosing such basement shall be of masonry.

Sec. 641. (Strength of Timber Constructions.—Outside of Fire Limits.)—The provisions of this chapter as to the strength and stability of timber constructions shall also apply to the construction of frame buildings outside of the fire limits.

Sec. 642. (Frame Buildings Prohibited.—Exception.)—Hereafter no frame building shall be erected within the fire limits of the city, except where express provision is made in this chapter therefor.

Outside of the fire limits it shall be lawful to erect frame buildings not exceeding forty feet in height from the sidewalk to the highest point of roof. If such frame buildings have a basement story of masonry, their height above the sidewalk may be made not to exceed forty-five feet.

Sec. 643. (Frame Buildings Inside Fire Limits.—Altered or Enlarged.)—No existing frame buildings inside the fire limits shall be altered or enlarged beyond the limit of height and dimensions described in Sections 642 and 646 of this chapter.

Sec. 644. (Frame Buildings Inside the Fire Limits Changed Into Flat Buildings.—Fire Walls.)—Whenever any frame building inside the fire limits shall be remodeled, altered or changed for the purpose of using the same for flats or apartments, or whenever such frame building shall be occupied for flat or apartment purposes, each suite of apartments in such building shall be separated from every other suite of apartments in such building by a wall of incombustible material, of such dimensions and thickness as required by this chapter.

Sec. 645. (Frame Buildings.—Raising.—Requirements.—Changing Gable or Hip Roofs to Flat Roofs.)—Permission may be granted by the Commissioner of Buildings for the raising of existing frame buildings, whether within or without the fire limits, to the limits of height hereinbefore fixed for new frame buildings, and no more. The Commissioner of Buildings is also authorized to issue permits for changing gable or hip roofs of existing frame buildings to flat roofs, and for the raising of walls incident to such change. But if such hip or gable roof is changed to a flat roof and the walls raised in connection with such change, the total cubic contents included by the walls so raised and the roofs so altered shall not exceed the cubic contents originally included in such gable or hip roofs.

Sec. 646. (Frame Buildings.—Damaged.—Repairing.—Limitations.)—It shall not be lawful to repair or reconstruct or remove any frame building which has been injured more than fifty per cent of its original cost by wear and tear, by the effects of the elements or by fire.

Sec. 647. (Lot Lines.—Requirements as to.—Number.—Dimensions.)—Frame buildings shall not be built nearer than one foot to any line of the lot upon which they are built, street and alley lines excepted. It shall not be lawful to erect a frame building wider than forty feet nor deeper than seventy feet, unless such building be divided by a fire wall or fire walls, built of incombustible material and of a thickness to be approved by the Commissioner of Buildings, so that no more than two thousand eight hundred square feet of superficial area shall be contained in any section or part of such building, uninclosed by such fire wall. If more than one frame building is built in the direction of the depth of any one lot, such buildings shall not be built with a less distance than ten feet between them.

Sec. 648. (Chimneys in Frame Buildings.—Chimney Flues Through Partitions.)—Chimneys in frame buildings shall be built of brick, or of hollow tile, with a double tile wall around the smoke duct; all joints, whether in tile or in brick chimneys, shall be well filled with mortar and neatly pointed on the outside. Brick chimneys shall have flue linings of fire clay on the inside where the inclosing walls are less than eight inches thick. The wood framing of frame buildings shall be trimmed around chimneys in such manner as not to come within two inches of the same.

Metal smoke pipes or tile flues of single thickness shall not extend through the floors or through the ceiling or roof of any building; and where such smoke pipes or tile flues pass through partitions the woodwork of such partitions shall be protected either by a course of brick built all around such smoke pipes or tile flues, or by a thimble made of bright tin, the two rings thereof being at least three inches apart, with proper ventilating holes provided in the outer covering of the same on both sides of the partitions.

Sec. 649. (Frame Buildings Carried to Uniform Height.)—Frame buildings, the different parts of which are of different heights, may be carried up to a uniform height, provided the greatest height thereof does not exceed the limits of height prescribed in this chapter for frame buildings.

Sec. 650. (Basement or Story Placed Beneath Frame Buildings.)—A frame building may be raised for the purpose of erecting a basement or story, or both, thereunder, but the principal floor of such frame building shall not be raised to a higher level than sixteen feet above the sidewalk grade of the sidewalk upon which such premises abut. The walls inclosing such basement or story shall be of masonry and not less than twelve inches thick, excepting that when a one-story frame building is raised and has a basement only built thereunder the masonry wall of such basement may be eight (8) inches thick above grade and twelve (12) inches thick below. The foundations of such walls shall be constructed as provided in this chapter. Provided, however, that no frame building shall be raised for the purpose of constructing a basement or story, or both, under the same to a greater height to the top of its roof than that elsewhere herein given as the maximum height above grade for frame buildings. The thicknesses of walls hereinabove required shall also apply to new frame buildings.

Sec. 651. (Sheds.—Frame.—Requirements.)—Sheds not exceeding fourteen feet in height from the ground at the highest point thereof, and not exceeding three hundred feet in area, with an incombustible roof, may be constructed of wood within the fire limits. Such sheds shall not be located on the front part of any lot, nor shall they be used as a dwelling or as an addition to a dwelling house, or for any business purpose whatever, nor shall more than one shed be erected on any one building lot of twenty-five feet in width.

Sec. 652. (Sheds.—Open Shelter.—Height of Walls and Foundation.—Enclosed.—Inside Fire Limits.)—Amended by ordinance Nov. 25, 1907, to read as follows:

Open shelter sheds not exceeding eight hundred square feet in area may be erected within the fire limits, provided they have roofs of incombustible material and the highest point is not over fifteen feet above the ground, and that the roofing be supported on sufficient posts or piers. Such sheds shall have no combustible enclosing walls or wooden

floors, provided that a floor of two-inch planking laid directly upon the ground may be used. Such sheds shall only be erected upon the rear of the lot, and not more than one such shelter shed or any other shed shall be erected on any lot of twenty-five feet in width.

If it is desired to enclose an open shelter shed, the enclosing walls shall be made of brick, hollow tile, or other incombustible material, and such walls shall have foundations extending to solid ground and at least four feet below the surface of the ground.

Open shelter sheds may be erected outside the fire limits not to exceed twenty-eight hundred square feet in area and subject to the approval of the Commissioner of Buildings.

Sec. 653. **(Sheds.—Coal, Brick and Salt Sheds along Railroad Tracks and Navigable Streams.)**—Amended by ordinance of June 3, 1907, to read as follows:

That open shelter sheds to be used for the storage or handling of coal, brick or salt may be erected within the fire limits, upon, along or adjacent to steam railroad tracks or along navigable waters; provided such sheds shall have incombustible roofing and shall not exceed thirty-five feet in height from the ground to the highest point of the roofing. If it is desired or intended to enclose any such sheds, enclosing walls thereof shall be covered with incombustible material. No such coal or salt sheds shall be built upon any lot or parcel of ground fronting upon any street within seventy-five feet of any building used exclusively for residence purposes, unless the consent of the owners of the majority of the frontage on both sides of such street between the two nearest intersecting cross streets shall have first been obtained by the person or corporation desiring to erect and maintain such coal or salt shed.

Sec. 654. **(Lumber or Junk Yards.—Lumber or Junk Not to Be Piled Near Residences Except by Consent.)**—No person or corporation shall establish, maintain, conduct or operate any lumber yard or place at, upon or in which new or second-hand lumber is kept for sale or is stored for seasoning or drying, or where old iron or junk is kept or stored on any premises fronting on any street in any block where two-thirds of the buildings on any street bounding any such block are used exclusively for residence purposes, unless the written consent of the owners of a majority of the frontage on both sides of all the streets bounding the block in which it is proposed to locate, establish, conduct or maintain such lumber yard or place be first obtained by the person or corporation desiring to establish, maintain or operate such lumber yard or place consenting to the issuance of a license for the establishment, keeping or maintenance of such lumber yard or place; and such written consents shall accompany the application for a license made by such person or corporation.

Sec. 655. **(Lumber Not to Be Piled Near Planing Mills, Woodworking Establishments or Private Residences.)**

Amended by ordinance of January 2, 1907, to read as follows:

No lumber shall be piled for the purpose of storage, seasoning or drying the same, within fifty feet of any planing mill or wood working manufactory, nor within one hundred feet of any private residence, unless the same has been erected since the establishment of such yard.

Sec. 656. **(Grand Stands.—Frame.—Within the Fire Limtis.—Frontage Consents.)**—Wooden grand stands or tiers of seats commonly known and described as grand stands, may be erected within the fire limits where no part of any such structure shall be within sixty feet of any other building or structure, provided that the person or corporation desiring a permit for the construction of such a grand stand shall first obtain the consent in writing of the owners of a majority of the frontage on both sides of the street or streets on each side of the block or square in which it is desired to erect such grand stand.

Sec. 657. **(Ice Houses.)**—Amended March 19, 1906, to read as follows:

Houses to be used exclusively for the storage of ice may be constructed within the fire limits of wood with incombustible roofing, the walls to be inclosed with an envelope of incombustible material; eight-inch brick or tile or approved cement concrete walls, with proper foundations of masonry, shall be used for such envelopes, and such houses shall be used for no other purposes than the storage of ice.

Provided, however, houses to be used exclusively for the storage of ice, may be erected and maintained contignous with any lake, and six hundred feet from any other building, except buildings used in connection with the conduct of said business, outside of the fire limits, may be constructed of frame, with incombustible roofing, and may have a floor area of not to exceed 80,000 square feet.

Houses to be used exclusively for the storage of ice may be constructed of frame, with incombustible roofing, outside of the fire limits, of greater floor area than 80,000 square feet, provided that building is divided by a solid wall of masonry for each additional 80,000 square feet of floor area, or fractional part thereof, said wall to be approved by the Building Department, and to extend one foot beyond the enclosure of said building on each end.

Houses to be used exclusively for the storage of ice, built contigious with railroad tracks, and not within one hundred feet of any other building, outside of the fire limits, may be constructed of frame, with incombustible roofing, with a floor area of not to exceed 5,000 square feet.

Houses to be used exclusively for the storage of ice, contiguous with railroad tracks and not within one hundred feet of any other building, outside the fire limits, may be constructed of frame, with incombustible roofing, of a larger area than 5,000 square feet, provided that building is divided by a solid wall of masonry for each additional 5,000 feet of floor area, or fractional part thereof, said wall to be approved by the Building Department, and to extend at least one foot beyond the enclosure of said building on each end.

All dividing walls must extend through and above the roof of any building in which they are built to a distance of three feet and must be covered with incombustible coping. No dividing wall shall be of less thickness than 12 inches at any point thereof.

ARTICLE XVIII.

ELEVATORS AND HOISTWAYS.

Sec. 658. **(Elevators, Passenger and Freight.—Permit for Construction.—Fee.)**—Before proceeding with the construction of any passenger or freight elevator, except such as are hereinafter specially exempted from the provisions of this chapter, there shall be obtained from the Commissioner of Buildings by the owner or agent of the building in which such elevator is to be constructed or by the contractor who is about to construct such elevator a permit for such construction, and it shall be unlawful for any such owner, agent or contractor to permit or allow the construction of any such elevator, or to proceed with, or in or about any of the work of construction of any such elevator until such permit shall first have been obtained. Such permit shall be issued by the Commissioner of Buildings after application shall have been made to him in writing therefor by any such owner, agent or contractor, specifying the number and kind of elevators which it is desired to construct and the location of the building or structure in which the same is or are to be placed, such application shall be accompanied with such plans and specifications as may be necessary to advise and inform said Commissioner of the plan of construction, type of elevator and location thereof. If such plans and specifications shall show that such elevator or elevators is or are to be constructed or erected in conformity with the provisions of this chapter, the Commissioner shall approve the same and shall issue a permit to such applicant upon the payment by such applicant of a fee of two dollars for each elevator to be constructed and erected, and such fee shall be known as a construction fee, and shall not be held to cover the cost of any inspection which shall at any time thereafter be made of such elevator or elevators when constructed or any of the equipment thereof.

Any person, either as owner or agent of any building or structure in which any elevator or elevators is or are to be constructed, or any contractor engaged in erecting or constructing such elevator or elevators, who shall allow to be erected or constructed, or who shall attempt to erect or construct any elevator or elevators in any building or structure, without having previously obtained the permit herein required, and without having complied with the provisions of this section, shall be fined not less than fifty nor more than two hundred dollars for each offense.

Sec. 659. **(Testing of Safety Devices.)**—Every passenger or freight elevator hereafter constructed (except such as are hereinafter excepted from the provisions of this chapter) in any building within the city shall be provided with some efficient device to secure the safe operation of such passenger or freight elevator in its running up or down, and such device shall be subjected to such practical test as may be determined by the Commissioner of Buildings to ascertain the efficiency of such safety device to properly perform the service for which it is intended; and it shall be the duty of the Commissioner of Buildings to cause to be made such test of each and every device upon any such elevator hereafter constructed, and no such elevator hereafter constructed shall be permitted to run until the inspection herein provided for has been made and a certificate issued by the Commissioner of Buildings or such inspector that the same has been inspected, and the certificate shall be posted in a conspicuous place in such elevator. Every passenger or freight elevator now in operation within the city shall be provided with some efficient device to procure the safe operation of such passenger or freight elevator in its running up and down, and such device shall be subjected to the same test as is herein provided for elevators to be hereafter constructed, and a certificate of such inspection issued as provided for elevators to be hereafter constructed, and every such elevator now in operation within the city, or which may hereafter be constructed and operated in the city, shall be inspected under and by authority of the Commissioner of Buildings at least once every six months. Every owner or agent of any building who fails to comply with any pro-

vision of this section shall be fined not less than fifty dollars nor more than two hundred dollars for each offense, and every owner or agent of any building wherein any passenger or freight elevators are situated in the city who refuses to permit the inspection of any such elevator or who refuses to permit the making of the test in this section provided, shall be fined not less than twenty-five dollars nor more than two hundred dollars for each and every day on which such elevator runs or is operated on and after the date of the refusal to permit inspection of such elevator or the refusal to allow such test to be made.

Sec. 660. **(Safety Devices.—Further.)**—Every passenger or freight elevator now running or operating within the city, or which may hereafter be constructed and run and operated, shall be provided with some efficient device for the purpose of preventing the cab or car of such elevator from falling, or the securing of the safety of the cab or car and its load, in case it does fall, and all such devices that are applied to such passenger or freight elevator for the purpose of preventing such cab or car from falling or for stopping it in case it does fall shall be subjected to a practical test, such test to be made under the supervision of the Commissioner of Buildings, to determine the efficiency of such device and to secure the safety of the cab or car and its contents. Every person, whether owner or agent of any building wherein any such passenger or freight elevator within the city is now run or operated, or which may hereafter be constructed or operated, who shall fail or neglect to provide such passenger or freight elevator with such device for the purpose of preventing the cab or car from falling, or the securing of the safety of the cab or car in case it does fall, shall be fined not less than twenty-five dollars nor more than two hundred dollars for each and every day on which such elevator is run or operated without being provided with such device.

Sec. 661. **(Tests.—Owner Must Permit.)**—Any owner or agent of any building wherein any passenger or freight elevator is run or operated within the city who desires to have a test made by and under the authority of the Commissioner of Buildings as to whether such elevator is provided with sufficient and proper safety devices shall or may notify said Commissioner of Buildings in writing that such a test is desired; and the time when such test may be made, which shall not be less than two nor more than ten days after such notice is given to the Commissioner of Buildings; and it shall be the duty of every owner or agent of any such building wherein any such passenger or freight elevator is run or operated in the city, or which may hereafter be constructed and operated, to permit the making of the test of such devices upon demand being made by the Commissioner of Buildings or by a duly authorized inspector, and every owner or agent of any such building wherein any such passenger or freight elevator is run or operated, or which may be hereafter constructed and operated, who refuses to permit the test of such devices to be made upon demand of said Commissioner of Buildings or Elevator Inspector, within five days from and after such demand is made, shall be fined not less than twenty-five dollars nor more than two hundred dollars for each and every day on which such passenger or freight elevator is run or operated after such demand for and refusal of the making of such test.

Sec. 662. **(Certificate to Be Furnished and Posted.)**—Whenever any such elevator shall have been inspected and the tests herein required shall have been made of all safety devices with which such elevator is required to be equipped, if the result of such inspection and tests shall show such elevator to be in good condition, satisfactory to the Commissioner of Buildings or the Inspector of Elevators, and that such safety devices have been provided, in accordance with the requirements of this chapter, and are in good working condition and in good repair, it shall be the duty of the Commissioner of Buildings or Inspector of Elevators to issue or cause to be issued, upon the payment of the inspection fee required by the provisions of this chapter, a certificate setting forth the result of such inspection and tests, and whether such elevator and its equipment is in safe condition and in good working order. Such certificates shall be furnished to the owner or agent of the building wherein such elevator is operated, and shall be posted by such owner or agent in a conspicuous place in such elevator.

If the result of such inspection or tests shall show such elevator not to be in safe condition or not to be in a condition of good repair, or shall show that such devices, or any of them, have not been furnished, or, if furnished, are not in good working order or in a good condition of repair, such certificate shall not be issued until such elevator and its equipment or such safety device or devices shall have been put in good working order and in a good condition of repair, satisfactory to the Commissioner of Buildings or the Inspector of Elevators.

In any event, however, the inspection fees herein required shall be paid either at the time application is made for inspection or upon the completion of such inspection and tests.

Sec. 663. (Tests to Be Made Semi-annually.)—It shall be the duty of the Commissioner of Buildings to cause the tests to be made as provided for in Sections 659, 660 and 661 of this chapter of each passenger and freight elevator in the city at least once in every six months from and after the issuance of the first certificate.

Sec. 664. (Inspectors.—Duties Of.—Power of Commissioner to Shut Down Elevators.)—Whenever any inspector of any passenger or freight elevator finds any of the running parts or automatic devices, or other equipment out of order or in an unsafe condition he shall immediately report the same to the Commissioner of Buildings, together with a statement of all the facts relating to the condition of such elevator or elevators.

It shall be the duty of the Commissioner of Buildings, upon receiving a report from any inspector of the unsafe condition of any elevator, to order and cause such elevator to be stopped from use until the same shall have been placed in a safe condition, and any owner or agent of any building wherein any such passenger or freight elevator is run or operated within the city who permits or allows any such elevator to run after the receipt of a notice, in writing, from the Commissioner of Buildings that any such elevator is out of order, or is in an unsafe condition, shall be fined not less than twenty-five dollars nor more than two hundred dollars for each and every day on which such elevator is run or operated without being put in a safe condition or placed in good order.

Sec. 665. (Device.—Efficient.—To Be Approved.)—Any device which shall prove efficient for the purposes hereinbefore described in this chapter shall be approved by the Commissioner of Buildings, if, after a test by said Commissioner or any of his Elevator Inspectors, it is found that such device or devices satisfactorily performs the work it is intended should be performed by such device or devices in and by the provisions of this chapter.

Sec. 666. (Inspections to Be Made at the Same Time.—One Fee.)—All certificates for and inspections of hoistways and elevators provided for in this article shall be made at the same time and the fee required to be paid by Section 668 of this chapter shall include the cost of all such inspections and issuance of such certificates.

Sec. 667. (Elevators Not Required to Be Equipped with Safety Devices.)—The provisions of this chapter requiring the equipment of elevators with safety devices shall not apply to any elevator or elevators in any private residence not more than three stories in height, nor to any hand hoists, elevator or hoist used solely for hoisting materials or tools in any building in course of construction.

For the purposes of this section, flat or apartment buildings shall not be held to be private residences, and any elevator or elevators operated in such flat or apartment buildings shall be equipped with safety devices in accordance with the provisions of this chapter.

Sec. 668. (Inspections.—Fees.)—The owners, agents or occupants of any building in which an elevator is used shall pay to the City Collector, before a certificate of inspection is issued, a fee of two dollars for each inspection of each elevator made in pursuance of the provisions of this chapter.

Sec. 669. (Certificates of Inspection.—Construction.—Details Of.)—When an inspector finds a hoistway, door, shaft and elevator and its equipment, including safety devices, in a sound and safe condition, he shall make and deliver to the owner, or to his agent, a certificate signed by the Commissioner, which shall contain the date of inspection, the condition of the elevator at that date, the weight it may safely carry, and a statement that the shaft, doors and all equipments, including safety devices, are constructed in a safe and proper manner and are constructed in accordance with the provisions of this chapter, which certificate shall be by the owner of the elevator framed and put in some conspicuous place in such elevator for examination by the public; provided, that the words "safe condition" in this section shall mean that it is safe for any load up to the amount of weight named in such certificate.

Sec. 670. (Hatch.—Doors.—Freight Elevators.)—It shall be lawful for elevators used exclusively as freight elevators to be without inclosing walls, but in all such cases there shall be at every floor through which such freight elevators pass automatic hatch closers or automatic doors, made in such manner that they will fully close each well hole when the temperature in such well hole exceeds one hundred and forty degrees Fahrenheit; and it shall be the duty of the owner, agent or person in possession, charge or control of the building in which such elevator or elevators is or are maintained to keep such hatch closers or doors at all times in good working order, and any such owner, agent or person failing to do so shall be fined not less than twenty-five dollars nor more than two hundred dollars for each offense.

Before any doors shall be considered as complying with the provisions of this section they shall be examined by the Commissioner of Buildings and the Fire Mar-

shal, and if it be found by such officials that such doors will automatically close when the temperature at or near the same exceeds one hundred and forty degrees Fahrenheit, and that also the conditions of construction and operation of such doors or hatch closers are such that there is no reasonable probability of their getting out of order and failing to operate when required, and if there is nothing in their construction or operation that is likely to cause accidents to or interference with the elevator service in the hatch holes which they are intended to close, then, and in such case only, shall the use of such hatch closers or doors be permitted.

But such automatic hatch closers or doors shall only be permitted in cases where the building in which such freight elevator is in use shall be equipped with stairways, or stairways and passenger elevators, sufficient to afford ample means of escape from such building in case of fire for all persons employed or for all persons in such building, and in buildings not so equipped such freight elevators shall be inclosed in fireproof walls, as hereinafter required.

Provided, that all freight elevators herein specified shall be either inclosed in fireproof walls, as hereinafter required, or equipped with automatic hatch closers or doors, as herein specified; and provided, further, that this section shall not apply to elevators in fireproof buildings.

Sec. 671. **(Passenger and Freight Elevators.—Inclosure Of.)**—In all non-fireproof buildings all passenger elevators and all freight elevators, except such as are expressly excepted by this chapter, shall be inclosed in a wall of brick, tile or such other incombustible material as may, from time to time, be approved by the Commissioner of Buildings as proper and suitable for the purpose; such wall to extend from the foundation to the roof of such building, and when built of brick or tile to be entirely self-sustaining; provided, that where such elevator shafts are placed within walls or partitions of fireproof material surrounding such shafts in common with stairways, or in common with stairways and corridors, additional inclosures about such shafts alone shall not be required. Provided, further, however, that the provisions of this section shall not apply to any non-fireproof building which is equipped throughout on every floor and in every room thereof and in all stairways, platforms, elevator shafts, elevator hoistways and well holes with an automatic sprinkler system approved by the Fire Marshal.

Sec. 672. **(Doors.—On Elevators.)**—In all elevator shafts which are herein required to be inclosed with fireproof walls, the openings through which ingress and egress to and from such elevators is had, shall be equipped with fireproof doors, of iron or other incombustible material, to be approved by the Building Commissioner, which shall be made to open from the inside, except that they shall also be made to open from the outside by means of a key or other device satisfactory to the said Commissioner.

Sec. 673. **(Skylights.—Over Elevators.—Windows.)**—The roof of each such passenger elevator, shaft or inclosure shall be formed by a skylight, and passenger elevators shall have a ventilator of at least one-twentieth of the area of the shaft, which shall have an operating device which shall be operative from every floor. Skylights may be omitted in shafts wherein there are windows opening on streets, alleys or courts or other vacant spaces, which will permit sufficient light and air, but such windows shall be glazed with fire-resisting glass.

The foregoing provisions relating to elevators and hoistways shall apply to buildings now existing or hereafter constructed.

Sec. 674. **(Safety of Employes.—Provisions For.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

In every building or structure under construction, where machinery is employed, the belting, shafting, gearing, elevators and every other portion of machinery, when so located as to endanger the lives and limbs of those employed therein while in the discharge of their duties, shall be, as far as possible, so covered or guarded as to make them reasonably safe and to prevent injury to such employes.

ARTICLE XIX.

FIRE ESCAPES AND STANDPIPES.

Sec. 675. **(Buildings Required to Have Fire Escapes and Standpipes.—Inspection.—Fee.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

All buildings in the City of four or more stories in height, except any building used exclusively for a private residence, having two flights of stairs leading from the ground to the top floor of the building, shall be provided and equipped with one or more stairway fire escapes, as described in Section 683 of this Chapter, provided that on any building of Class VI, four stories in height, in which each occupant shall have access to at least two separate and distinct stairways from the top floor to the ground, a combination standpipe

and ladder fire escape may be allowed. And provided also that buildings now in existence having a sufficient number of stairways properly located and which are now equipped with ladder fire escapes shall be exempt from the provisions of this section.

No stairway fire escapes shall be less than twenty-four inches wide and shall have wrought iron or steel balconies with suitable handrailings at each floor, or in such numbers and locations as shall be satisfactory to the Commissioner of Buildings, all firmly secured to the outside walls of the building.

All such fire escapes shall be put up and completed to conform to the buildings for which they are respectively intended, and shall be inspected after completion, and, if found to be in a perfectly safe and satisfactory condition, a certificate to that effect shall be issued by the Commissioner of Buildings to the owner, agent, or occupant of any such building, upon payment to the City Collector of a fee of two ($2) dollars for each and every fire-escape.

All fire-escapes in the City shall be painted with mineral paint at least once a year.

Sec. 676. **(Specifications for Ladder Fire Escapes.—Anchors.)**—All single and double fire escapes, with ladders, hereafter erected, shall be in strict accordance with the following specifications:

There shall be no less than three one-inch square wrought-iron anchors to every six-foot balcony, and six for a twelve-foot balcony. Such anchors shall pass through the wall of building and bolt on the inside with a three-fourths by two inch nut and three and one-half inch iron washer back of nut, where the wall is not over twenty inches thick; but where wall is over twenty inches thick, anchors shall be inserted at least eight inches into the wall on an angle of thirty-five degrees.

The brace of anchors shall at least be twenty inches spread, and pass into the wall four inches at bottom. No other form of anchors shall be allowed without a special permit from the Commissioner of Buildings.

Sec. 677. **(Balconies.)**—All balconies hereafter erected shall be either steel or wrought iron, capable of sustaining a weight of five hundred pounds to the square foot. The balcony frame shall be made of not less than one and one-half by three inch angle iron, securely riveted together, with crossbars every two feet, such bars to be punched one-half inch square every two inches center, and one-half inch square iron forced through the same, leaving a manhole of not less than twenty-four by twenty-four inches. The crossbars shall be securely riveted to the angle iron frame. The crossbars for a balcony twenty-eight inches wide shall be one and one-half by three-eighths inch iron. Balcony frames over twenty-eight inches wide shall be made of not less than two by three-eighths inch iron to conform with the increased dimensions of iron in crossbars; for thirty-inch balcony, two by three-eighths inch; for thirty-six inch balcony or over, two and one-half by three-eighths inch. All balconies over this width shall have a two-inch "T" iron through the center of balcony for the bars to rest upon. Such balconies shall have a substantial cast or wrought iron post every three feet, bolted to the balcony. No balcony shall have less than two guard rails, which shall be of wrought iron, or new pipe not less than three-fourths inches in diameter, and the ends shall be anchored in the wall of building not less than ten inches on an angle of thirty-five degrees.

Sec. 678. **(Ladders.)**—The ladder, where used in combination with the standpipe, shall be bolted to such standpipe with short tapped bolts every four feet and bolted to the balconies. Rungs of ladder shall be one-half inch square iron, with the corners upward, so as to give a safe footing. Every other run shall be riveted and shall be fourteen-inch centers. Where a ladder is put up without a standpipe, the side guards shall be two by three-eighths inch flat iron or one and one-fourth inch pipe. All ladders shall be seventeen inches or more between pipes. No second-hand pipe shall be used.

Sec. 679. **(Standpipes Outside Buildings.)**—Amended by ordinance of Feb. 17, 1908, to read as follows (Superseding amendatory ordinances of Oct. 22, 1906, and Nov. 23, 1907):

The standpipe shall be of the best three-inch wrought iron, seven and one-half pounds to the foot, and a two and one-half inch brass hose valve, of the City standard thread, shall be attached to the standpipe at every outlet at each floor and on the roof. The owner, agent, occupant, or person in possession, charge or control of the premises where said standpipe is located is hereby required to keep the said standpipe and hose connections oiled, free from all obstructions, in good working order, and accessible for immediate use at all times. The said standpipe and hose valves shall be inspected and tested by the Fire Department as often as once in three months, and oftener if deemed necessary by the Fire Marshal.

Sec. 680. **(Standpipes.—Pumps.—Axes, Etc.)**—Amended by ordinance of July 8, 1907, to read as follows (Superseding amendatory ordinance of March 19, 1906):

(1) *In every building over one hundred* (100) *feet in height not provided with a three* (3) *inch or larger standpipe, in all buildings hereafter constructed of a greater height*

than seventy-five (75) feet (except buildings used for theater purposes, as herein elsewhere provided for); in all buildings used for hospital purposes of a greater height than three (3) stories, with accommodations for at least twenty (20) patients; and in all buildings of a greater height than five (5) stories now or hereafter used for hotel or public lodging house purposes there shall be constructed one (1) or more four (4) inch standpipes, which shall extend from basement to roof and which shall be connected at street or alley side of building with two-way Siamese connection for use of Fire Department, and which shall be provided with one hose connection, with Fire Department thread, on the roof of said building, on each floor and in the basement thereof, with sufficient hose attached to reach any point thereof. The pattern, quality, installation and maintenance of such standpipe, hose and couplings, shall be subject to the approval of the Fire Marshal.

(2) In any of the buildings herein referred to where approved sprinkler systems are installed and properly maintained, it shall not be necessary to install additional inside standpipe as above provided for.

(3) On each floor and in the basement of every building used for hotel, public lodging or school purposes, three or more stories in height, there shall be two (2) or more portable hand pumps or chemical extinguishers, one or more fire axes and one or more pike poles. In the basement or janitor quarters of all apartment buildings three or more stories in height, the floors of which are divided into two or more apartments, and in the basement of all office buildings four or more stories in height, there shall be provided one or more portable hand pumps or chemical extinguishers, one or more fire axes and one or more pike poles; all of which shall be installed and maintained subject to the approval and supervision of the Fire Marshal.

(4) The interior of all grain elevators and malt houses of a height of fifty (50) or more feet, which are not entirely fireproof, and which have a capacity of two hundred and fifty thousand (250,000) bushels or over, and the interior of all cold storage houses of a height of four (4) or more stories, which are not entirely fireproof and which have a ground floor area of ten thousand (10,000) or more square feet, shall be equipped with either a dry or wet sprinkler system, to each of which systems there shall be a feeder or riser pipe or pipes not less than four (4) inches in diameter, leading from one or more Siamese steamer connections; all of which shall be installed and maintained subject to the approval of the Fire Marshal.

(5) Grain elevators which are equipped with Journal Fire Alarm Systems of the most approved pattern and which are left at all times in the most perfect working order, or grain elevators, malt houses and cold storage houses, which are now equipped with standpipes of approved pattern and hose with not less than two (2) inch connections which have been installed in accordance with City ordinances and approved by the Fire Department, each floor of which is approved by said department as being at all times easily accessible to firemen, where fire extinguishers, water barrels and pails are distributed at intervals on all floors on advice and instruction of the Chicago Underwriters' Association; where the necessary pump pressure is maintained; where some approved electric watch service and fire alarm system is maintained and watchmen are employed during nights, Sundays and holidays, pulling such stations not less frequently than once per hour, and which have outside Siamese connections and standpipes not less than two and one-half (2½) inches, shall be exempt from the provisions of this ordinance.

Sec. 681. **(Siamese.)**—Amended by ordinance Feb. 17, 1908, to read as follows:

There shall be a two-way automatic Siamese at the bottom of each standpipe, so that two steam fire engines may be attached to it without interfering with each other. Such Siamese shall be within easy reaching distance from the sidewalk and be securely anchored to the wall of the building. The owner, agent, occupant, or person in possession, charge or control of the premises where such standpipe and Siamese are located, is hereby required to provide such covering or protection to the fittings of said Siamese steam engine connection for the purpose of keeping said fittings and connection clear and unobstructed as shall be ordered and required by the Fire Marshal. The protection or covering herein referred to shall apply to all standpipes located inside of buildings, as well as outside of buildings, and include connections to automatic sprinkler equipment.

Sec. 682. **(Anchors for Top of Standpipe.—Painting.)**—All the anchors for the top of standpipe and ladders shall pass through the wall and bolt on the inside of same.

All work shall be painted with two coats of the best mineral paint, and all holes shall be filled up with the best cement.

Sec. 683. **(Stairway Fire Escapes.—Erection of.—Location.—Component Parts.)**—The Commissioner of Buildings or *Inspectors* shall determine upon the location of all stair fire escapes before erection of same is commenced.

A permit shall be obtained from the Department of Buildings before work is commenced, which permit will be issued on payment to the city collector of a fee of two ($2) dollars.

No permit for a stairway fire escape projecting three feet or more from the face of the wall shall be granted unless a detailed plan for the fire escape, approved by

a licensed architect or practicing structural engineer, is submitted to the Commissioner of Buildings, and a copy of such plans shall be left on file with said commissioner.

(Anchors.)—All anchors for stairway fire escapes shall, wherever possible, pass through the wall of building and be secured on inside of same. Where it is impossible to anchor through walls, anchors shall be put in wall not less than fifteen inches at an angle of thirty-five degrees. On buildings of steel construction, where walls are less than twenty inches in thickness, there shall be steel channels at least four inches wide set on inside of building from column to column and bolted or riveted to columns, and anchors shall be bolted on inside of channels.

Anchors for a platform four feet two inches or less in width shall be made of one-inch square iron; over four feet two inches and not over six feet, shall be one and one-fourth inch square iron, with brace; over six feet, shall be one and one-half inch square iron, with brace. All anchors shall be turned up not less than six inches at the outside of platform to bolt post to.

(Braces.)—Braces shall be the same thickness as the anchors. Spread of braces shall be the width of platform. Where the platforms are over five feet in width, anchors shall have double braces, one to the outside and one to the center of platform.

(Platforms.)—Platforms shall be not less than fifty inches wide at ends; passageways shall be not less than twenty-four inches between building and railings. Platforms shall be not less than twelve feet in length. The frames and crossbars shall be made as specified by Section 677 of this chapter. Platforms shall have clips at each end bolted to anchors. No door or window or shutter shall open so as to obstruct in any way the free passage on or along a platform or a staircase or ladder fire escape.

(Stairs.)—All fire escape stairs for apartment buildings, hotels, boarding houses, factories and office buildings, where there are less than one hundred people, shall be not less than two feet wide between railings and stringers. Where there are more than one hundred people, stairs shall be three feet wide. All stairs for halls, churches, theaters, hospitals, schools, department stores and buildings where large numbers of people congregate shall be not less than three feet wide in the clear, and all passageways shall be not less than three feet wide in the clear; stringers shall be made of two bars three by five-sixteenths inch, about one inch apart, or four and one-half by three-eighths inch flat iron. Where over twelve feet in length, they shall have anchor and brace in center. The treads shall be made of one-half inch square steel or iron, corner upwards not to exceed one and five-eighths inches center, riveted at ends to two by five-sixteenths inch flat iron or steel. There shall be not less than four bars to a tread, where treads are less than twenty-seven inches in length; where treads are over twenty-seven inches in length, there shall be not less than six bars to a tread; then, there shall be a truss supporting treads made of bar iron two inches by three-eighths of an inch, riveted to bars of treads in center, supported by two seven-sixteenth inch rods bolted at each end of treads. All stairs shall have an incline of about forty-five degrees; rise of treads shall be not less than seven inches and not more than ten inches.

(Railings.)—All stairs shall have three bar railings made of one-inch bar iron for top rail and three-quarter inch bar iron for lower rail, and when such stairs are more than three inches from wall of building, then there shall be one or more hand rails on the wall side of such stairs.

(Posts.)—All posts used for stair fire escapes shall be made of one and one-half inch angle or channel iron not less than three feet six inches high, and shall have braces on outside turned upwards and fastened to frame of balcony or stairs and not less than half way up the post; all stair fire escapes shall extend to the ground, either by counterbalance or drop stairs. Cables for counterbalance stairs shall be not less than three-quarters inch in size, and shall be well oiled or greased when hung up, and oiled or greased at least once a year. All pulleys and cables holding counterbalance shall be covered at bracket, so as to protect it from snow or ice.

(Painting.)—All stair fire escapes shall be painted with two coats of paint, one at the shop and one after completion at the building.

Where it is impossible to erect stair fire escapes according to these specifications, then plans shall be submitted to the Commissioner of Buildings or *Inspectors* for approval.

All such fire escapes shall, on completion, be inspected by the *Inspectors*, and if found safe and satisfactory, a certificate will be issued upon payment of one ($1) dollar to the city collector.

As amended Nov. 25, 1907 (Substituting the word "Inspectors" for the words "Fire Escape Inspectors," wherever they occur.)

Sec. 684. (Fire Escapes In General.)—No fire escape of any kind shall be constructed except upon a permit therefor issued by the Commissioner of Buildings upon the payment by the applicant therefor to the city collector of a permit fee of two dollars.

Every building in the city required by law to be equipped with metallic standpipes and wrought iron or steel balconies, or other fire escape devices, shall have displayed in conspicuous places, on each floor of such building, notices sufficient in number and in plainly legible type at least six inches in height, indicating and showing the location of such metallic ladders, balconies and fire escapes and the easiest way to reach them. If such notices be not displayed within thirty days after such equipment and kept continuously displayed, said commissioner is authorized to take such action as may be necessary to have such building closed.

Sec. 685. (Penalty.)—Any owner, agent or person in possession, charge or control of any such building, who violates, disobeys, omits or neglects to comply with the terms of the foregoing section, shall be fined not less than five dollars nor more than fifty dollars for each offense, and every such owner, agent or person shall be deemed guilty of a separate offense for every day such violation, disobedience, omission or neglect shall continue, and shall be subject to the penalty imposed hereby for each and every such separate offense.

Where stair fire escapes pass windows or doors, the windows or doors shall be of fire-resisting glass and have metal frames and sash, or such fire escapes shall be hooded with metal for at least two feet each side of such opening.

ARTICLE XX.

FIRE LIMITS.

As defined by ordinance passed March 29, 1909.

Sec. 686. (Fire Limits of City.)—The fire limits of the City of Chicago shall be and are hereby defined as follows: All that part of the City of Chicago bounded by the following limits: Commencing at the intersection of the shore of Lake Michigan and a line one hundred and fifty feet north of the center line of Belmont avenue, thence west on said first mentioned line to the center line of North Halsted street, thence south along said center line of North Halsted street to the center line of Fullerton avenue, thence west along said center line of Fullerton avenue to the center of the North Branch of the Chicago River, thence northwesterly along the center of said North Branch of the Chicago River to the center line of Belmont avenue, thence west along said center line of Belmont avenue to the center line of Kedzie avenue, thence south along said center line of Kedzie avenue to the center line of West North avenue, thence west along said center line of West North avenue to the center line of North Fortieth avenue, thence south along said center line of North Fortieth avenue to the center line of the first alley north of Park avenue, thence west along the center line of said alley to the center line of South Forty-sixth avenue, thence south along said center line of South Forty-sixth avenue to the center line of West Madison street, thence west along the center line of West Madison street to the center line of South Forty-eighth avenue, thence north along said center line of South Forty-eighth avenue to the center line of Kinzie street, thence west along said center line of Kinzie street to the center line of South Fifty-second avenue, thence south along said center line of South Fifty-second avenue to the center line of West Madison street, thence east along said center line of West Madison street to the center line of South Fiftieth avenue, thence south along said center line of South Fiftieth avenue to the north line of the present right of way of the Chicago & Great Western Railroad Company, thence east along the said north line of said right of way to the center line of South Forty-eighth avenue, thence south along the said center line of South Forty-eighth avenue to the center line of West Twelfth street, thence east along said center line of West Twelfth street to the center line of South Forty-sixth avenue, thence south along said center line of South Forty-sixth avenue to the center line of West Twenty-second street, thence east along said center line of West Twenty-second street to the center line of South Fortieth avenue; thence south along said center line of South Fortieth avenue to the center line of the Illinois and Michigan Canal, thence northeasterly along the center line of the said canal to the center line of South Western avenue; thence south along said center line of South Western avenue to the center line of West Thirty-ninth street, thence east along said center line of West Thirty-ninth street to the center line of State street, thence south along said center line of State street to the north line of West Forty-seventh street, thence west along said north line of West Forty-seventh street to a line seventy-five feet west of the west line of South Halsted street, thence south to a line seventy-five feet north of the west line of South Halsted street along said line seventy-five feet west of the north line of West Sixty-third street, thence west along said line seventy-five feet north of the north line of West Sixty-third street to the center line of South Ashland avenue, thence south along the center line of South Ashland avenue to the center line of West Sixty-third street, thence east along said center line of West Sixty-third street

to the center line of State street, thence south along said center line of State street to the center line of East Seventy-fifth street, thence east along said center line of East Seventy-fifth street to the center line of Colfax avenue, thence south along the center line of Colfax avenue to the center line of Seventy-ninth street, thence east along the center line of Seventy-ninth street to the shore of Lake Michigan, thence northerly and northwesterly along the shore of Lake Michigan to the place of beginning.

Also, commencing at a point in the center of Manistee avenue, where it intersects the right of way of the main line of the Lake Shore & Michigan Southern Railroad; thence northeasterly and north along the center line of Manistee avenue to the center line of Eighty-ninth street, thence east along the center line of Eighty-ninth street to the center line of Mackinaw avenue, thence south along the center line of Mackinaw avenue to the center line of Harbor avenue, thence southwesterly along the center line of Harbor avenue to the center line of Ninety-third street; thence west along the center line of Ninety-third street to the easterly line of the Baltimore & Ohio railroad right of way; thence south along the easterly line of the Baltimore & Ohio railroad right of way and Baltimore & Ohio railroad extended, to the northeasterly line of said Lake Shore & Michigan Southern Railroad; thence northwesterly along the northeasterly line of said right of way to the place of beginning.

As defined by ordinance Passed March 29, 1909.

Also commencing at the east line of Jackson Park avenue and the south line of the Pittsburg, Ft. Wayne and Chicago Railroad Company's right-of-way, and running southeasterly along the right-of-way along the Pittsburg, Ft. Wayne and Chicago Railroad Company's right-of-way to the north line of Eighty-third street, thence west along the north line of Eighty-third street to Jackson Park avenue, thence north along the east line of Jackson Park avenue to the place of beginning.

Sec. 687. **(Fire Limits.—Provisional.)**—Provided, however, that any person desiring to erect a frame or wooden building, to be used for residence or mercantile purposes within that portion of the territory bounded on the east, between Sixty-seventh and Seventy-fifth streets, by Lake Michigan, on the south by the center line of Seventy-fifth street, on the west by the center line of State street to the intersection of Sixty-third street, thence east along the center line of Sixty-third street to the intersection of Cottage Grove avenue, thence south along the center line of Cottage Grove avenue to the intersection of Sixty-seventh street, thence east along the center line of Sixty-seventh street to Lake Michigan, shall have a right to do so, upon presenting a petition to the Commissioner of Buildings, together with a plat, plans and specifications showing the place where such building is to be erected. Such petition shall be verified by the affidavit of the applicant and shall contain the written consent of the owners of a majority of the frontage upon each side of the streets or alleys in the block or square in which the building is to be erected.

No frame or wooden residence or mercantile building shall be erected within the said provisional fire limits exceeding forty feet in height unless the basement story shall be constructed of brick or stone, in which case the height shall not exceed forty-five feet above the sidewalk.

Sec. 688. **(Fire Limits.—Exception From.)**—There shall be excepted from the fire limits as hereinbefore defined, the territory bounded as follows:

Commencing at the intersection of a line seventy-five feet west of the west line of State street and a line seventy-five feet south of the south line of Forty-seventh street, thence west along said line seventy-five feet south of the south line of Forty-seventh street to a line seventy-five feet east of the east line of Wentworth avenue, thence south along said line seventy-five feet east of the east line of Wentworth avenue to a line seventy-five feet north of the north line of Sixty-third street to a line seventy-five feet west of the west line of State street, thence north along said line seventy-five feet west of the west line of State street to the place of beginning.

Also that territory within the lines beginning at the intersection of a line seventy-five feet west of the west line of Wentworth avenue, and a line seventy-five feet south of the south line of Forty-seventh street; thence west along said line seventy-five feet south of the south line of Forty-seventh street to a line seventy-five feet east of the east line of South Halsted street; thence south along said line seventy-five feet north of the north line of South Halsted street to a line seventy-five feet north of the north line of Sixty-third street; thence east along said line seventy-five feet north of the north line of Sixty-third street to a line seventy-five feet west of the west line of Wentworth avenue; thence north along said line seventy-five feet west of the west line of Wentworth avenue to the place of beginning.

As amended by ordinance of February 26, 1906.

ARTICLE XXI.
FRONTAGE CONSENTS.

Sec. 689. **(Definition of Word "Block," as Used in This Chapter.)**—Whenever in this chapter a provision is made that frontage consents shall be obtained for the erection, construction, alteration, enlargement or maintenance of any building or struc-

ture in any block, the word "block," so used, shall not be held to mean a square, but shall be held to embrace only that part of a street bounding the square which lies between the two nearest intersecting streets, one on either side of the point at which such building or structure is to be erected, constructed, altered, enlarged or maintained, unless it shall be otherwise specifically provided.

Sec. 690. **(Hospitals.—Permits.—Special Consents.—Height Of.)**—It shall be unlawful for any person or corporation to build, construct, maintain, conduct or manage in any block, if two-thirds of the buildings fronting upon both sides of the streets bounding such block or square are devoted exclusively to residence purposes, any hospital for the care, treatment or nursing of three or more insane persons; or any hospital for the care, treatment or nursing of three or more inebriates, or persons suffering from the effects of the excessive use of alcoholic liquors; or any hospital for the care, treatment or nursing of three or more epileptics; or any hospital for the care, treatment or nursing of three or more persons addicted to, or suffering from, the excessive use of morphine, cocaine or other similar drugs or narcotics; or any hospital for the care, treatment or nursing of any person or persons affected with any infectious or contagious disease, unless the owners of a majority of the frontage in such block and in addition thereto the owners of a majority of the frontage on the opposite sides of the streets bounding such block consent in writing to the building, constructing or maintaining, managing or conducting of any such hospital in such block. Such written consents of the majorities of such property owners shall be filed with the Commissioner of Buildings, and an exact copy of same shall be filed with the Commissioner of Health before a permit shall be granted for the building or constructing or a license issued for the maintaining, conducting or managing of any such hospital. Provided, that any such building that may be used for such purposes as set forth in this section and which is over two stories in height shall be of fireproof construction throughout, and no hospital shall be built to exceed six stories in height. (Repealed—See note at bottom of page.)

Sec. 691. **(Hospitals.—Location of Near School Houses.)**—Amended by ordinance March 4, 1907, to read as follows:

No hospital of any kind or description hereafter erected or established shall be erected or established on any lot or parcel of ground any part of which is located within four hundred feet by the nearest traveled route of any property used for school purposes. pealed—See note at bottom of page.

Sec. 692. Amended July 13, 1908, to read as follows:

It shall not be lawful for any person or corporation to locate, build, construct or maintain on any street or alley in the city any building or place used for junk shop or junk yard without the written consent of a majority of the property owners in the block in which said junk shop or junk yard is sought to be located, built, constructed or maintained according to the frontage on both sides of such street or alley; nor for any person or corporation to locate, build, construct or maintain on any street or alley in the city in any block in which two-thirds of the buildings on both sides of the street are used exclusively for residence purposes any building or place used for gas reservoir, packing house, rendering plant, soap factory, tannery, boarding, livery or sale stable, blacksmith shop, foundry, brewery or distillery, grain elevator, or laundry to be run by machinery, or machine shop, without the written consent of a majority of the property owners according to the frontage on both sides of such street or alley.

Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction of any such building or place: provided, that in determining whether two-thirds of the buildings on both sides of the street are used exclusively for residence purposes any building fronting upon another street and located upon a corner lot shall not be considered.

Note.—See also ordinance amending this section as to Blacksmith Shops, under "Amendments," on page 186.

Under amendments see also ordinance requiring frontage consents for buildings used for theatrical or dramatic entertainments, etc., together with an ordinance prohibiting such buildings nearer than 200 feet of a church or *educational* building.

Sec. 693. **(Reformatories.—Sheltering Institutions.)**—It shall be unlawful for any person or corporation to build, construct, maintain, conduct or manage any reformatory, rescue or sheltering institution in any block or square in which two-thirds of the buildings on both sides of the street or streets on which the proposed reformatory, rescue or sheltering institution may front are used exclusively for residence purposes, without the written consent of a majority of the property owners, according to frontage, on both sides of the streets bounding such block.

Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction or keeping of such building.

Note:—These two sections, 690 and 691 (together with 279), repealed by ordinance governing Hospitals, passed June 1, 1908, page 509 et seq., Council Proceedings.

Provided, that in determining whether two-thirds of the buildings on both sides of the street are used exclusively for residence purposes, any building fronting upon another street and located upon a corner lot shall not be considered.

Sec. 694. **(Permits for Moving Frame Buildings.—Requirements.—Written Consents Must Be Obtained.—Affidavits Made.)**—Permits to move frame buildings shall be granted, if any such frame building has not been damaged to an extent greater than fifty per cent of its original cost, by fire, wear and tear, the action of the elements or otherwise. *Any person desiring to remove a frame building shall first obtain the written consent to such removal from persons owning a majority of the frontage of the lots on both sides of the street in the same block to which the building is to be removed.*

As amended by ordinance of June 5, 1906.

This section shall not apply to the case of any person removing a building upon his own premises and not going upon the premises of any other person, or upon any street, alley or other public place, in making such removal.

Provided, however, that no permit shall be issued for the removal of any frame building from any point outside the fire limits to any point within the fire limits, when such building is of such a character that it would not be lawful to build it within the fire limits.

ARTICLE XXII.

USE AND OBSTRUCTION OF STREETS FOR BUILDING PURPOSES.

Sec. 695. **(Sidewalk and Street.—Occupation Of.—Limitations.)**—The extent of occupation of sidewalk and street to be covered by the terms of a permit for street obstruction or building shall be as follows:

Such permit shall not authorize the occupation of any sidewalk or street or part thereof other than that immediately in front of the lot or lots upon which any building is in process of erection and in relation to which such permit is issued.

During the progress of building operations a sidewalk not less than four (4) feet in width shall be at all times kept open and unobstructed for the purpose of passage in front of such lot or lots. Such sidewalk shall, if there are excavations on either side of the same, be protected by substantial railings which shall be built and maintained thereon so long as such excavations continue to exist. It is not intended hereby to prohibit the maintenance of a driveway for the delivery of material across such sidewalk from the curb line to the building site.

Sec. 696. **(Sidewalks.—Delivery of Material.—Elevated Sidewalks.)**—It shall be permitted for the purposes of delivering material to the basements of buildings in process of erection to erect elevated temporary sidewalks to a height of not exceeding four feet above the curb level of the street; and in case a sidewalk is so elevated, it shall be provided with good, substantial steps or easy inclines on both ends of the same and shall have railings on both sides thereof.

Sec. 697. **(Sidewalks.—Temporary Roof Over.—Time Maintained.)**—If the building to be erected is more than four stories in height, and is set at or near the street line, there shall be built over the adjoining sidewalk a roof having a framework and covering composed of supports and stringers of three by twelve timbers, not more than four feet from centers, covered by two layers of two-inch plank.

Such roof shall be maintained as long as material is being used or handled on such street front and above the level of such sidewalk.

In all cases such temporary sidewalks and their railings and approaches, and the roofs over the same, shall be made, as regards ease of approach, strength and safety, to the satisfaction of the Commissioner of Buildings.

Sec. 698. **(Street.—Storage of Building Materials.—Limitations.)**—The occupation of the street for the storage of building materials, or for temporary sidewalks, shall never exceed, in front of any one building, one-third of the width of the roadway of the same, and in no event shall any material be stored or placed within four feet of any street or steam railway track.

Sec. 699. **(Sidewalks and Street.—Excavated Material and Rubbish On.—How Cared For.)**—Earth, other than sand to be used in the construction of the building, taken from excavations, and rubbish taken from buildings shall not be stored either upon sidewalks or roadways of streets, and shall be removed therefrom from day to day as rapidly as produced. When dry rubbish, apt to produce dust, is being handled, it shall be kept wetted down so as to prevent its being blown about by the wind.

Sec. 700. **(Derricks.—Limitations.)**—For all buildings more than four stories in height, the use of derricks set upon the sidewalk or street is prohibited. In no case shall the guy lines be less than fifteen feet above the roadbed.

Sec. 701. **(Frontage Adjacent.—How Occupied for Building Purposes.)**—If the written consent and a waiver of claims for damages against the city of the owners of

properties abutting upon the site of any proposed building is first obtained and filed with the Commissioner of Public Works, the permission to occupy the roadway and the sidewalk may be extended beyond the limits of such building in front of the property for which the consent of the owner or lessee thereof has been secured, upon the same terms and conditions as those herein fixed for the occupation of sidewalk and street in front of the building site.

Sec. 702. (Street, Use of, for Building Purposes.—When Terminated.)—Streets and sidewalks may be occupied for the purposes of building only in connection with the actual erection, repair, alteration or removal of buildings, and permission for such occupancy shall terminate with the completion of such operation. It shall be unlawful to occupy any sidewalk or street after the completion of the operation for which a permit has been issued by the Department of Buildings. It shall also be unlawful to occupy a sidewalk or street, under authority of such permit, for the storage of articles not intended for immediate use in connection with the operations for which such permit has been issued.

Sec. 703. (Red Lights.)—Red lanterns shall be displayed and maintained during the whole of every night at each end of every pile of material in any street or alley and at each end of every excavation.

Sec. 704. (Street Obstructions.—Permits.—Bonds.—Fees.)—Permits for the obstruction of streets shall be issued by the Commissioner of Public Works and shall be paid for, in proportion to the street frontage occupied, at the rate of two dollars per month for each twenty-five feet of frontage so occupied.

No permit shall be issued until the applicant therefor shall have executed and filed with the Commissioner of Public Works a bond, with sureties to be approved by said Commissioner, and in an amount to be designated by him (in no case to be less than ten thousand dollars), conditioned to indemnify, save and keep harmless the city from any and all loss, cost, expense or liability of any kind whatsoever which it, the city, may suffer or be put to or which may be recovered from it from or by reason of the issuance of such permit, or by reason of any act or thing done under or by virtue of the authority given in such permit.

ARTICLE XXIII.

BILLBOARDS AND SIGNS.

This entire article amended by ordinance of January 2, 1907, together with a new section, to be known as Section 706 a, added.

Sec. 705. (Billboards or Signboards on Buildings.)—Every billboard of greater height than two feet and placed on any building shall be faced with iron or other incombustible material with framework of wood or iron, and shall be securely anchored and fastened to such building in such manner as to make the same safe, to the satisfaction and approval of the Commissioner of Buildings. When such billboard or signboard is situated above or upon the roof of any building the supports and framework for same may be of wood, and the number of such supports and the construction of same and the construction of the framework for same shall be satisfactory to and approved by the said Commissioner.

No billboard or signboard anchored to, fastened to, or situated above or upon the roof of any building shall be placed so that the face of same shall come within three feet of the inner plane of the outer wall of such building, nor shall the same be constructed so that the bottom of such billboard or signboard shall be less than one foot or more than three feet above the surface of such roof; the face of such billboard or signboard shall not exceed ten feet in height, nor shall it exceed twenty-four feet in length for every twenty-five feet of frontage on the building on which it is placed, nor extend beyond the wall of said building; and such billboard or signboard shall have a door in the center of same which can be readily opened and which when so opened will leave a clear space at least four feet in width and seven feet in height from the roof to the top of said door.

No billboard or signboard shall be anchored to, fastened to or situated above or upon the roof of any building more than two (2) stories in height; and no billboard or signboard shall be anchored to, fastened to or situated above or upon the roof of any building having other than a flat roof.

No billboard or signboard such as is described in this section, whether anchored to or fastened to any building or situated or located upon the roof thereof, shall be constructed and put in place unless in accordance with plans and specifications which have been submitted to and approved by the Commissioner of Buildings.

Sec. 706. (Size and Construction of Billboards and Signboards Erected Within Fire Limits Otherwise Than on Buildings.)—No billboards or signboards erected within the fire limits as now defined or as they may hereafter be defined by ordinances

of the City (other than signboards and billboards referred to in Sections 705 and 707 hereof) shall exceed twelve (12) feet in height, and the same shall be constructed of tin or galvanized iron or some other equally incombustible material, except that the stringers, uprights and braces thereof may be made of wood. All such billboards or signboards shall be securely anchored or fastened so as to be safe and substantial.

Sec. 706 a. **(Height and Distance From Ground of Billboard or Signboard Erected Within Fire Limits.)**—No billboard or signboard (other than those referred to in Sections 705 and 707 hereof) shall be constructed within the fire limits at a greater height than seventeen feet above the level of the adjoining street, and the base of the billboard or signboard shall be in all cases at least five feet above the level of the adjoining street, and in case the surface of the ground upon which such billboard or signboard is erected is above the grade of the adjoining street, the base of such billboard or signboard shall be not less than two feet above the surface of the ground. In case the grade of the adjoining street or streets has not been established, no such billboard or signboard shall be constructed at a greater height than seventeen feet above the level of the street adjoining the ground upon which such billboard or signboard is erected.

Sec. 707. **(Wooden Billboards or Signboards.—Construction.—Size.—Exceptions.)**—Billboards or signboards not exceeding twelve square feet in area may be built of wood or other combustible material, and such billboards or signboards shall be exempt from the provisions of this article. Signs erected flat against the face of buildings shall also be exempt from the provisions of this Article, provided that such signs shall be safely and securely fastened to the building.

Sec. 708. **(Billboards or Signboards Erected Outside of the Fire Limits.—Construction.—Size.)**—All billboards or signboards erected outside of the fire limits as now defined or as they may hereafter be defined by the ordinances of the city (other than those referred to in Sections 705 and 707 hereof) shall comply with the following conditions:

If such billboard or signboard be erected or located so that no part thereof is nearer than ten feet to any building, wooden fence, or other structure, such billboard or signboard may be constructed of wood or other combustible material, but no part of same shall exceed seventeen feet in height, and the same shall be so constructed that there shall be a clear space of not less than five feet between the bottom of such billboard or signboard and the surface of the ground upon which such billboard or signboard is erected. If any part of such billboard or signboard shall be within ten feet of any building, wooden fence, or other structure, the size and construction of such billboard or signboard shall be limited as is provided in Sections 706 and 706a for billboards or signboards erected within the fire limits. All billboards or signboards erected outside of the fire limits as provided for in this section shall be securely anchored or fastened so as to be safe and substantial.

Sec. 709. **(No Billboard or Signboard Shall Be Erected Without Permit.)**—No billboard or signboard such as is described in this article shall be erected or maintained within the City unless a permit shall first have been secured by the person desiring to erect or maintain such billboard or signboard from the Commissioner of Buildings, to whom application for such permit shall be made; and such application shall be accompanied by such plans and specifications of the proposed billboard or signboard as are necessary to fully advise and acquaint the said Commissioner with the construction of such proposed billboard or signboard. If the plans and specifications accompanying such application shall be in accordance with the provisions of this article, said Commissioner shall thereupon issue a permit for the erection of such billboard or signboard, upon the payment by the applicant of a fee as hereinafter fixed; provided, however, that none of the provisions of this article shall apply to or affect any billboard erected upon land abutting the right-of-way of any railroad where such billboard does not come within twenty-five feet of any public highway and where the bottom of such billboard is not less than three feet from the ground and the same is situated more than fifty feet from any building.

Sec. 710. **(Alteration and Repair of Billboards and Signboards.)**—No material alteration of any billboard or signboard shall be made except upon a written permit issued by the Commissioner of Buildings authorizing such alteration; and such permit shall be issued upon application in writing made to such Commissioner by the owner of such billboard or signboard or by the person in charge, possession, or control thereof, accompanied by a plan or statement of the proposed alterations to be made; which, if satisfactory to and approved by the Commissioner of Buildings, shall authorize such applicant to receive a permit upon the payment of a fee therefor

as hereinafter fixed; but such alteration shall not be construed to apply to the changing of any advertising matter of any billboard or signboard, nor the refacing of the framework supporting same.

Sec. 711. (Billboards Now Existing to be Altered to Comply with the Provisions of this Article.)—Every now existing billboard or signboard, whether erected upon or above the roof of any building or attached or fastened to the wall or walls of any building, or standing upon or erected upon any lot or premises, which is now erected or which is now maintained contrary to the provisions of this article, shall be forthwith removed or altered, changed, or cut down so as to fully comply with such provisions; and any billboard or signboard now existing and not complying with the provisions of this article which shall not have been removed or torn down or so altered and changed within nine months from and after the passage of this ordinance as to be brought into conformity with the provisions of this article by the owner thereof or by the person in charge, possession, or control thereof, shall be torn down by the Commissioner of Buildings and the cost and expense of tearing down such billboard or signboard shall be charged to the owner of such billboard or signboard or the person in charge, possession, or control thereof, and shall be recovered from such person for the use of the city by any appropriate proceeding therefor.

Sec. 712. (Duty of Commissioner.—Owner's Name to be Placed on Top of Billboard.)—It shall be the duty of the Commissioner of Buildings to inspect all plans and specifications submitted in connection with the erection or construction or the alteration or repair of any billboard or signboard and to approve same if the method of construction and provisions made for fastening, securing, anchoring and maintaining such billboards or signboards are such as will serve to protect the public and to render such billboards or signboards safe and substantial. It is further made the duty of the Commissioner of Buildings to exercise a supervision over all billboards and signboards erected or being maintained under the provisions of this article; and whenever it shall appear to said Commissioner that any such billboard or signboard has been erected in violation of this ordinance or is in an unsafe condition or has become unstable or insecure or in such a condition as to be a menace to the safety of the public, he shall thereupon issue or cause to be issued a notice in writing to the owner of such billboard or signboard or the person in charge, possession or control thereof, if the whereabouts of such person is known, informing such person of the violation of this ordinance and the condition of such billboard or signboard and directing him to make such alterations or repairs thereto or to do such acts or things as are necessary or advisable to place such billboard or signboard in a safe, substantial and secure condition, within such reasonable time as may be stated in said notice. If the person so notified shall refuse, fail, or neglect to comply with and conform to the requirements of such notice, said Commissioner shall, upon the expiration of the time therein mentioned, tear down or cause to be torn down such billboard or signboard, and shall charge the expense of such tearing down to the person so notified. If the owner of such billboard or signboard or the person in charge, possession, or control thereof cannot be found or his whereabouts is not easily ascertainable, the Commissioner shall attach or cause to be attached to such billboard or signboard a notice of the same import as that required to be sent to the owner where such owner is known; and if such billboard or signboard shall not have been made to conform to this ordinance and placed in a secure, safe, and substantial condition, in accordance with the requirements of such notice, within thirty days after such notice shall have been attached to such billboard or signboard, it shall be the duty of the Commissioner of Buildings to thereupon order such billboard or signboard torn down; provided that nothing herein contained shall prevent the Commissioner of Buildings from adopting such precautionary measures as may be necessary or advisable in case of imminent danger in order to place such billboard or signboard in a safe condition, the expense of which may be charged to and recovered from the owner of same in any appropriate proceeding therefor. No permit shall be issued to any applicant for permission to erect a billboard or signboard unless such applicant shall agree to place and maintain on the top of such billboard or signboard the name of the person or corporation owning same or who is in charge, possession, or control thereof. It shall be the duty of the Commissioner of Buildings to see to it that the name of the person or corporation owning or in possession, charge, or control of such billboard or signboard is placed upon such billboard or signboard forthwith upon the erection thereof and is kept thereon at all times while such billboard or signboard is maintained; and in case the owner of such billboard or signboard or the person in charge, possession, or control thereof shall fail or refuse to place and maintain such name on the same after due notice from the Commissioner of Buildings he shall be subject to the penalty hereinafter provided for.

Sec. 713. **(Fees for Permits.—Indemnifying Bond.)**—Amended by ordinance Dec. 2, 1907, to read as follows:

The fee to be charged for permits issued for the erection or construction of billboards or signboards or for the alteration thereof shall be two dollars for each twenty-five lineal feet of billboard or signboard so erected.

Any person, firm or corporation engaged in the business of erecting billboards or signboards within the City limits for the purpose of display advertising shall file with the City Clerk of the City of Chicago an approved bond in the sum of twenty-five thousand ($25,000) *dollars to indemnify the City against any lawsuits brought or judgments obtained against the City of Chicago, or any of its officials, resulting from accidents by such billboards or signboards.*

Sec. 714. **(Penalty.)**—Any person or corporation owning, operating, maintaining, or in charge, possession, or control of any billboard or signboard within the city, who shall neglect or refuse to comply with the provisions of this article, or who erects, constructs or maintains any billboard or signboard that does not comply with the provisions of this article, shall be fined not less than twenty-five dollars nor more than two hundred dollars for each offense; and each day on which any such person shall permit or allow any billboard or signboard owned, operated, maintained or controlled by him, to be erected, constructed, or maintained in violation of any of the provisions of this article, shall constitute a separate and distinct offense.

Sec. 715. **(Fences.—Height of.)**—No wooden fences shall be constructed of greater height than eight feet above the sidewalk grade or eight feet above the surface of the ground where no grade is estabished.

ARTICLE XXIV.

STORAGE OF OILS.

Sec. 716. **(Storage of Oils.—Buildings for Storage of Oils.—Walls.—Roof.—Floor.)**—Buildings designed for the storage of crude petroleum, gasoline, naphtha, benzine, camphine, carbon oil, spirit gas, burning fluid, spirits of turpentine or coal, rock or earth oils (excepting such refined oils as will stand a fire test of one hundred and fifty degrees Fahrenheit according to the method and direction of John Tagliabue), shall be constructed as follows:

The walls shall be of brick, stone, or concrete, and shall be not less than sixteen inches thick or more than sixteen feet high. The lower floor of such buildings shall be at least three feet below the grade of the adjoining street and shall be made of earth, concrete or brick. The roof of such buildings shall be made of tile, metal or other incombustible material, and the outside walls of any such building having a flat roof shall extend at least eighteen inches above the roof. The coping upon the roof of such buildings shall be made of incombustible material. Such buildings shall be detached from all other buildings and shall be properly ventilated. Where any such building shall be located less than twenty-five feet away from any other building or structure, the wall or walls of such building on the side or sides thereof, within such distance of twenty-five feet from any other building or structure shall have no window or other opening therein; provided, however, that if such building cannot be so constructed that no outside wall thereof shall be less than twenty-five feet away from any other building or structure, in such case, openings may be made in the wall of such building which is located farthest away from any other building or structure for the purpose of admitting light or providing means of access thereto or egress therefrom. If such opening be a window, the glass in such window shall be fire-resisting glass, and such window shall be provided with a steel shutter.

No such building shall be occupied for any purpose other than the storage of oils, and no person shall be permitted to use any such building as a sleeping apartment or dwelling place.

The interior cubic capacity of any such building shall exceed by at least twenty-five per cent the total capacity of the tanks or other receptacles placed in such building.

Such buildings and the equipment thereof, including the protection of the doors and windows, shall be constructed according to plans and specifications which have been submitted to and approved by the Commissioner of Buildings.

Sec. 717. **(Tanks for Storage of Oils.)**—Tanks for the storage of any one or more of the oils or fluids mentioned in the preceding section may be built outside of buildings either above or under the surface of the ground, provided the following specifications are complied with:

Such tanks shall be made of metal of sufficient gauge and tensile strength for the purpose for which they are to be used. All portions of such tanks are to be riveted together and shall be made liquid tight. Every such tank shall have a manhole and shall be equipped with adequate ventilating or safety devices.

All tanks other than those located in buildings constructed under the provisions of Section 716 of this article, whether placed above or below the surface of the ground, shall have no building or structure of any kind whatsoever over or above the same; provided, however, that if any such tank be located near a railroad track or manufactory or place where sparks are likely to fall, and it is desired, in order to obviate such danger, to construct over such tank a shed or shelter, such shed or shelter may be constructed upon a permit in writing therefor being issued by the Commissioner of Buildings; and such permit shall only be issued if it shall be shown that such shed or shelter is necessary and upon the express agreement that such shed or shelter shall be used for no other purpose than affording protection or shelter, and shall not be used for storage, manufacturing, residence, office, or any other purpose whatsoever.

Sec. 718. **(Walls Around Tanks.)**—Where any such storage tank or any portion thereof is erected or maintained upon or above the surface of the ground and is situated less than fifty feet from any other building or structure other than the buildings or structures upon the premises wherein such oils or fluids are to be used or stored, such tanks shall be separated from any such building or structure by an inclosing wall of brick, stone or concrete; and such wall shall be not less than five feet high and in no case of less height than two feet higher than the top of the tank which it is designed to separate from such building or structure. If such wall be ten feet high or less it shall be not less than twelve inches in thickness, and four inches in thickness shall be added for every additional ten feet or major fraction thereof of height added to such wall. Such wall shall entirely surround or inclose such tank; provided, however, that an opening may be constructed in such inclosing wall to permit access to the tank. Such opening shall contain a liquid-tight door made of incombustible material, either sliding or opening inward, and of sufficient strength to resist any pressure which may be brought to bear on such door by the bursting of the tank inclosed in such wall.

All such tanks and walls described in this section shall be constructed in accordance with plans and specifications which shall have been submitted to and approved by the Commissioner of Buildings.

Sec. 719. **(Storage of Petroleum, Etc.)**—It shall be unlawful for any person or corporation to keep or store crude petroleum, gasoline, naphtha, benzine, camphine, carbon oil, spirit gas, burning fluid, spirits of turpentine, or coal, rock or earth oil (excepting such refined oils as will stand a fire test of one hundred and fifty degrees Fahrenheit, according to the method and direction of John Tagliabue), upon or in any structure or premises, in any quantity exceeding one barrel of fifty gallons, within the city, except in such a building or such tanks as are hereinbefore described in this article, and where a quantity of any of such oils exceeding five gallons and not exceeding fifty gallons is kept in any premises other than such a building the receptacle or receptacles in which such oils is or are kept shall not be placed under any stairway or in any confined space, but shall be kept in such manner that no vapor or gas therefrom can collect in such a quantity as to become dangerous; and no such receptacle or receptacles shall be stored, kept or handled at any time within fifteen feet of any gas, candle, oil or other like artificial light or near any lighted stove, gas grate or any open flame of any kind whatsoever; provided, however, that a quantity of such oils exceeding one barrel of fifty gallons and not exceeding five barrels of fifty gallons each may be kept or stored in a room or apartment, the floor of which shall be at least five feet below the grade of the street adjacent to the building or structure in which such room or apartment is located, and such room or apartment shall have an air capacity of not less than fifteen hundred cubic feet and shall be properly ventilated in such manner as to prevent a dangerous accumulation of vapor or gas from such oils; and such room or apartment shall not be used for any purpose other than the storage and handling of such oils. In any such room or apartment as is last above described turpentine may be kept in a quantity not exceeding five hundred gallons.

No gas, candle, oil, or other like artificial light or lighted stove, gas grate, or other open flame of any kind whatsoever shall be allowed within fifteen feet of any receptacle or receptacles containing any of the oils or fluids mentioned in this article, while located, kept, or stored in any such room or apartment. If more than fifteen (15) barrels of any of the oils hereinbefore described are kept in any such building as herein provided for, such building shall be located not less than 100 feet away from any other building or structure.

Sec. 720. **(Petroleum, Etc., in Transit Not to Be Kept Near Buildings.)**—It shall be unlawful for any person or corporation engaged in the business of transporting or delivering any of the oils or fluids mentioned in this article to permit such oils or fluids to remain in barrels, tanks, or other like receptacles, upon any railroad track, street, wharf, or dock for a longer time than is reasonably necessary to make

provision for the storing or delivering of same; such time in no event, however, to exceed twenty-four hours.

Sec. 721. **(Oils, Sale of, Regulated.)**—It shall be unlawful for any person or corporation to sell, deliver, or receive any of the oils or fluids mentioned in this article, by gas, candle, oil, or other like artificial light.

ARTICLE XXV.

MISCELLANEOUS PROVISIONS.

Sec. 722. **(Roofs for Spectatorial Purposes.—Permits.)**—It shall be unlawful for any person, whether owner, lessee, manager or person in control or having charge of any building within the city, to permit the use of the roof of any house or building, whether free of charge or through admission fee, to any person as a place of observation or for spectatorial purposes, unless he has first obtained from the Commissioner of Buildings of the city a permit; provided, however, it shall not be unlawful for any person, whether, owner, lessee, or the person in control or having charge of such house or building, to permit the roof of any such house or building to be used as a place of observation or for spectatorial purposes for a number of persons not exceeding ten, and when no admission fee is charged.

Sec. 723. **(Inspection as to Safety of Buildings.)**—Before issuing the permit, as provided for in the foregoing section, the Commissioner of Buildings shall make an investigation as to whether such building is safe and secure enough to permit the presence of an estimated number of persons upon the roof thereof, and the permit so issued shall state the number of persons to be permitted on such roof. The Commissioner of Buildings shall see to it that every such roof is surrounded and enclosed with a railing or balustrade of sufficient height and strength to afford adequate protection.

Sec. 724. **(Fee for Inspection.)**—The person requiring such permit, as hereinabove provided for, shall make application to the Commissioner of Buildings for such an investigation, and shall pay, as a fee for such investigation and such permit, the sum of five dollars.

Sec. 725. **(Penalty.)**—Any person, whether owner, lessee, manager or person having charge or control of any such house or building within the city who shall permit, allow or tolerate the use of the roof of such house or building so controlled by him, by any person for a purpose within the meaning of Section 722 of this article, without first obtaining a permit as hereinbefore provided for, and without having the safety of such roof tested and investigated by the Commissioner of Buildings, as hereinbefore provided for, or who shall permit a larger number of persons than is provided for in his permit to congregate upon such roof, shall be fined not less than twenty-five dollars nor more than one hundred dollars for each offense.

Sec. 726. **(Windows, Cleaning of.—Safety Devices.)**—The owner or agent of every building hereafter erected in the city shall equip each and every window in any such building, above the second story thereof, with a suitable device or devices which will permit the cleaning of the exterior of each and every window in such building, above the second story, without danger to the person cleaning such windows, such devices shall be of such pattern and construction as will reasonably answer the purposes for which they are intended. Provided, however, that if windows are of such size that they may be easily cleaned from the inside, they need not be equipped with such devices.

Sec. 727. **(Penalty.)**—Any owner or agent of any building described in the preceding section who shall fail, neglect or refuse to comply with any of the provisions of such section, shall be fined not less than ten dollars nor more than fifty dollars for each offense, and each and every day which shall be allowed to elapse before any such building shall be supplied and equipped in accordance with the provisions of said section, shall constitute on the part of the owner or agent of any such building a separate and distinct offense.

Sec. 728. **(Scaffolds.—Protection During Building Operations.—Temporary Floors.)**—All scaffolds erected in this city for use in the erection, repair, alteration or removal of buildings, shall be well and safely supported, and of sufficient width, and properly secured, so as to insure the safety of persons working thereon or passing under, or by the same, and to prevent the falling thereof, or of any material that may be used, placed or deposited thereon.

It shall be the duty of every owner, person or corporation who shall have the supervision or control of the construction or remodeling of any building having more than three (3) framed floors, whether some or all of such floors are above or below the established street grade, to provide and lay upon the upper side of the joists or girders, or both, of the first floor below the riveters and structural steel setters, a

plank floor, which shall be laid to form a good and substantial temporary floor for the protection of employes and all persons engaged above or below or on such temporary floor in such building.

Provided, however, that where the permanent floor is in place on the floor herein required to be planked, a temporary protective floor shall not be required.

If the floor or permanent floor of the second floor, or of any other floor above the second, or roof, is being placed previous to the permanent floor of the floor immediately below the floor which is being arched or planked, a good and substantial temporary floor shall be laid on the joists and girders of the next lower floor. For the purposes of this section the lowest framed floor in a building shall be considered the first floor.

In buildings more than three (3) stories high, where persons are working on a scaffold or scaffolds on the outside of such building, such persons shall be protected by well-secured planking, set over the heads of such persons for the full width of the scaffolding on which they are working, if another story or other stories are being raised above such persons during the time they are working on such outside scaffold or scaffolding.

It shall be the duty of all owners, contractors, builders or persons having the control or supervision of all buildings in course of erection which shall be more than thirty (30) feet high, to see that all stairways, elevator openings, flues and all other openings in the floors shall be covered or properly protected.

Sec. 729. **(Penalty.)**—Any person violating any of the provisions of the foregoing section shall be fined not less than one hundred dollars nor more than two hundred dollars for each offense, and any permit granted for the construction of such building by the authorities of the city may be revoked in the discretion of the Commissioner of Buildings.

Sec. 730. **(Gas or Electric Shut-off Device.—Outside of Building.)**—Every building within the city in which gas or electricity is used for illuminating, heating or other purposes shall be equipped with a device or devices which will enable firemen to shut off the supply of gas or current of electricity to any such building from the outside thereof; such device or devices to be placed at such a point or at such points on the outside of any such building as may be designated by the Fire Marshal of the city, and to be of such design and construction as to enable such device or devices to perform with reasonable certainty and safety the work required to be done thereby.

Any device or devices installed for the purpose of carrying out the provisions of this section shall first be approved by the Fire Marshal, and after the installation thereof the control of any such device or devices so installed in or upon any building under the provisions of this section shall be under the supervision of the Fire Department of the city.

Provided, however, that buildings used exclusively for residence purposes and outbuildings, sheds or barns attached or appurtenant to buildings used exclusively for residence purposes, shall be exempted from the provisions of this section.

Sec. 731. **(Penalty.)**—Any owner, agent or person having control or charge of any building coming within the provisions of the foregoing section, who shall neglect, fail or refuse to equip any such building with a device or devices such as are described in the foregoing section, shall be fined not less than fifty dollars nor more than two hundred dollars for each offense, and each day which shall elapse before the equipment of any such building with a device or devices as herein required shall be deemed a separate and distinct offense, and any person who shall disturb, meddle or tamper with any device or devices installed under the provisions of the preceding section, upon any building or buildings, without authority from the Fire Marshal, shall be fined not less than ten dollars nor more than one hundred dollars for each offense.

Sec. 732. **(License.—Contractors.)**—Every person or corporation engaged within the city in the construction or repairing of the whole or any part of buildings and appurtenances shall be and he or it is hereby required to obtain a license from the city which shall permit him or it to engage thereafter in the business of contracting for the erection of buildings and appurtenances or parts thereof.

Sec. 733. **(Application.—Conditions.)**—Amended by ordinance Nov. 25, 1907, to read as follows:

Every application for such license shall be made to the Commissioner of Buildings and shall set forth the name and residence or place of business of the applicant and the nature of the work which he or it desires to engage in for a period of one year thereafter, and shall be accompanied by a fee of five dollars.

Sec. 734. **(License to Be Issued.)**—Said Commissioner shall thereupon issue a license in due form, permitting the applicant to engage in the business of contracting for the erection of buildings and appurtenances, or parts thereof, in the city for

one year from the date of such license, which date shall be the first day of May in the year in which such license is applied for, and no license shall be granted for any period less than a year, and all licenses shall run from the first day of May in each year until the thirtieth day of April in the succeeding year.

Sec. 735. (Penalty.)—Any person or corporation who shall engage in the business of building in the city under contracts for the whole or any part of buildings and appurtenances, without first having obtained a license therefor as aforesaid, shall be fined not less than twenty-five nor more than one hundred dollars for each offense.

Sec. 736. (Walls.—Structures.—Buildings Altered to Conform to Chapter.)—No wall, structure, building or part thereof shall hereafter be built, constructed, altered or repaired within the city except in conformity with the provisions of this chapter. No building already erected or hereafter to be built within the city shall be raised, altered or built upon in such a manner that if such building were wholly rebuilt or constructed after the passage of this ordinance it would be in violation of any of the provisions of this chapter.

Sec. 737. (Buildings.—Expense of Altering Recoverable from Owner by City.)—Whenever, in the opinion of the Commissioner of Buildings, it shall be necessary to tear down, alter, repair or rebuild any building or portion of any building which is dangerous, defective or unsafe, or which is reported to the said Commissioner by the Commissioner of Health to be unfit for human occupancy, or which has been built in violation of any of the provisions of this chapter or of any ordinance regulating the construction of buildings hereafter passed, said Commissioner of Buildings shall cause such building or such portion thereof to be torn down, altered, repaired or rebuilt, or such work to be done thereon as he may deem necessary to render such building, or such portion thereof, safe or fit for human occupancy, and the expense thereof shall be recoverable from the owner or owners of such building by any proceeding that may be deemed appropriate.

Sec. 738. (Penalty.—Fines for Violation of Chapter.)—Any person or corporation who violates, neglects or refuses to comply with, or who resists or opposes the enforcement of any of the provisions of this chapter, shall be fined not less than twenty-five nor more than two hundred dollars for each offense, and every such person or corporation shall be deemed guilty of a separate offense for every day on which such violation, neglect or refusal shall continue; and any builder or contractor who shall construct any building in violation of any of the provisions of this chapter, and any architect designing or having charge of such building who shall permit it to be constructed, shall be liable to the penalties provided and imposed by this section.

AMENDMENTS

Passed March 1, 1909.

Be it ordained by the City Council of the City of Chicago:

Section 1. That it shall be unlawful for any person, firm or corporation to locate, build, construct or maintain on any lot fronting on any street or alley in the city, in any block in which one-half of the buildings on both sides of the street are used exclusively for residence purposes, any building or place used for a blacksmith shop, without the written consent of a majority of the property owners according to frontage, on both sides of such street or alley. Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction of such building or place; provided, that in determining whether one-half of the buildings on both sides of the street are used exclusively for residence purposes, any building fronting upon another street and located upon a corner lot shall not be considered.

Section 2. That portion of Section 692 of the Revised Municipal Code of Chicago of 1905, as subsequently amended relative to blacksmith shops, together with all other ordinances, or parts of ordinances, are hereby repealed in so far only as they are inconsistent with this ordinance.

Section 3. Any person, firm or corporation who shall violate any of the provisions of this ordinance shall be fined not less than five dollars nor more than one-hundred dollars for each offense.

Passed December 21, 1908.

Be it ordained by the City Council of the City of Chicago:

Section 1. It shall not be lawful for any person, firm or corporation to locate, build, or construct on any street or alley in the city in any block in which two-thirds of the buildings on both sides of the street are used exclusively for residence purposes, any building for a theatrical, dramatic or operatic entertainment, show, amuse-

ment, game or public exhibition of any kind, intended or calculated to amuse, instruct or entertain where such show, amusement, game or exhibition is given for gain, or for admission to which the public is required to pay a fee, without the written consent of a majority of the property owners according to frontage on both sides of such street or alley.

Such written consent shall be obtained and filed with the Commissioner of Buildings before a permit is issued for the construction of any such building; provided that in determining whether two-thirds of the buildings on both sides of the street are used exclusively for residence purposes any building fronting upon another street and located upon a corner lot shall not be considered.

Passed January 25, 1909.

Be it ordained by the City Council of the City of Chicago:

Section 1. That it shall hereafter be unlawful for any person, firm or corporation to locate, build or construct any building for a theatrical, dramatic or operatic entertainment, show, amusement, field game or public exhibition of any kind intended or calculated to amuse, instruct or entertain where daily entertainments, shows, amusements, games or exhibitions are given for gain or for admission to which the public is required to pay a fee, within two hundred (200) feet of any church or building used exclusively for educational purposes; said distance to be measured by the shortest route between the entrance to the building sought to be located, built or constructed and the entrance to such church or building used exclusively for educational purposes.

Roller Skating Rinks

Ordinance passed May 18, 1908.

Be it ordained by the City Council of the City of Chicago:

Section 1. That no room or hall used for the purpose of a roller skating rink shall be constructed, operated or maintained above the first floor of any building.

Sec. 2. This ordinance shall be in full force and effect from and after its passage.

PROVISIONS FOR MOVING PICTURE MACHINES.

Sections 2, 3, 4, 6, 7, 8, 9, 10, 11, 12 and 13 are omitted as not containing anything of special interest to architects or builders, only those portions of the ordinance being published which might have bearing on construction.

Be it ordained by the City Council of the City of Chicago:

Passed July 13, 1908.

Section 1. There is hereby established a Board of Examiners of moving picture operators, consisting of three members, who shall be appointed by the Mayor by and with the advice and consent of the City Council, and shall be subject to removal by the Mayor.

Sec. 5. All moving picture films, when not in use in the operating booth, shall at all times be kept in metal cases.

This ordinance was considered by the Committee on Buildings, recommended by it, and passed Feburary 3, 1908.

Illuminated Roof Signs

Be it ordained by the City Council of the City of Chicago:

Section 1. That Chapter LXI, Article II of the Revised Municipal Code of Chicago of 1905 be and the same is hereby amended by inserting in said Chapter LXI, Article II, between Sections 2181 and 2182, Revised Municipal Code of Chicago of 1905, as amended July 2, 1906, a new section to be known as Section 2181a

HOSPITALS.

An ordinance relating to hospitals within the City.

Ordinance passed June 1, 1908.

Sections 1103, 1104, 1105, 1109a, 1109 b, 1109c, 1109d, 1109e, 1109f are omitted as having no special bearing in construction of hospitals but containing requirements as to license and operation of interest to physicians and hospital management after the building is constructed.

Be it ordained by the City Council of the City of Chicago:

Section 1. That Section 690 of the Revised Municipal Code of Chicago of 1905, and Sections 279 and 691 of said Municipal Code as amended and now in force, be and the same are hereby repealed.

Sec. 2. That Article XIII of Chapter XXXII of the Revised Municipal Code of Chicago as amended February 26, 1906, be and the same is hereby amended to read as follows:

Sec. 1102. (Hospitals and Maternity Hospitals.—Definitions.)—For the purpose

of this article a hospital is hereby defined to mean any institution or place used for the reception or care, temporary or continuous, of two or more sick, injured or dependent persons; or used for the treatment of two or more persons suffering from or afflicted with any mental or physical disease or bodily injury; including all hydropathic and massage institutions.

For the purposes of this article a maternity hospital is hereby defined to mean any institution, or place used for the reception and care, temporary or continuous, of one or more women during pregnancy while awaiting confinement, during confinement, or for one month or less after confinement while recovering therefrom.

Unless otherwise specified, the word "hospital" as used in this article includes maternity hospital.

Sec. 1106. **(Hospital Building Board.)**—For the purposes of this ordinance there is hereby created a Hospital Building Board which shall be composed of the Commissioner of Health, the Commissioner of Buildings and the Chief Fire Marshal. The Hospital Building Board shall meet upon call of the Commissioner of Health and shall make such recommendations to the City Council as they may deem necessary or expedient for the construction and erection of new hospital buildings and for changes in buildings now being used or which may hereafter be used for hospital purposes.

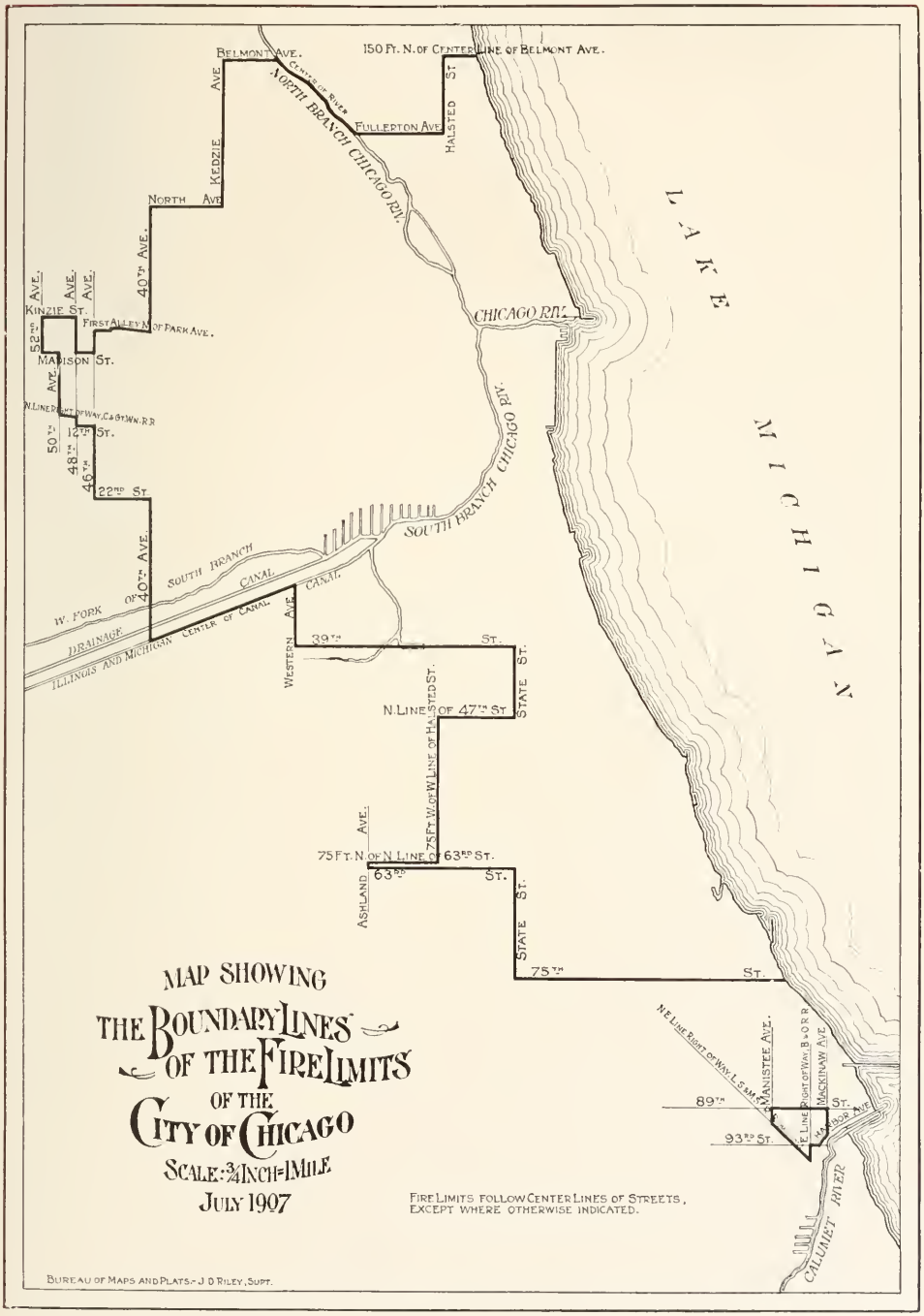
Sec. 1107. **(Accomodations for Patients.)**—In every such hospital each room occupied or to be occupied by patients shall be of such dimensions as to give each patient not less than 800 cubic feet of space; every room shall have at least one window connecting with the external air for each two beds; said windows shall be of such dimensions as shall secure to each patient at least 2,400 cubic feet of fresh air per hour by natural ventilation, or in case said window shall not secure said 2,400 cubic feet of air per hour by natural ventilation, then each room shall additionally be fitted with such appliances for ventilation as shall secure to each patient in said room at least 2,400 cubic feet of fresh air per hour. Each bed shall have at least eighty square feet of floor space. In case of a maternity hospital, a regularly licensed physician must reside on the premises. Each ward or wing in said hospital shall have running water furnished in one or more places either in said ward or convenient thereto so that the same may be adequate and convenient to the occupants thereof; the plumbing, water closets, bath rooms and other sanitary appliances and conditions shall be constructed in accordance with the city ordinances relating to these matters. The building shall have the floor of the cellar properly cemented so as to be water tight; the halls of each floor shall be open to the external air with suitable windows and shall have no room or other obstruction at the end unless sufficient light or ventilation is otherwise provided for said hall and the building as a whole shall be provided with adequate and proper fire escapes, stairways or inclines or exits.

There shall be provided in each hospital building a suitable room or rooms approved by the Commissioner of Health to be used for the isolation of cases of contagious, infectious, epidemic or communicable diseases that may be found in the hospital until such time as the parties suffering from such contagious diseases shall be removed, in accordance with the rules and regulations of the Health Department; and a suitable room or rooms approved by the Commissioner of Health for the proper care of the dead pending their removal.

Sec. 1108. **(Frontage Consents.)**—It shall be unlawful for any person, firm or corporation to build, construct, maintain, conduct or manage in any block in which two-thirds (2-3) of the buildings fronting on both sides of the street or streets on which the proposed hospital may front are devoted to exclusive residence purpose, any hospital for the care, treatment or nursing of two or more insane persons; or any hospital for the care, treatment or nursing of two or more inebriates, or person suffering from the effects of the excessive use of alcoholic liquors; or any hospital for the care, treatment or nursing of two or more epileptics; or any hospital for the care, treatment or nursing of two or more persons addicted to, or suffering from the excessive use of morphine, cocaine or other similar drugs or narcotics; or any hospital for the care, treatment or nursing of any person or persons affected with any contagious disease unless the owners of a majority of the frontage in such block, and the owners of a majority of the frontage on the opposite side or sides of the street or streets on which said building faces consent in writing to the building, constructing or maintaining, managing or conducting of any such hospital in said block. Such written consent of the majority of said property owners shall be filed with the Commissioner of Health before a permit shall be granted for the building or constructing, or a license be issued for the maintaining, conducting or managing of any such hospital.

Sec. 1109. **(Location of Hospitals Near School.)**—No hospital of any kind or description, shall hereafter be erected or established within four hundred (400) feet of any property used for public or parochial school purposes.

MAP SHOWING THE BOUNDARY LINES OF THE FIRE LIMITS OF THE CITY OF CHICAGO.



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All the Electrical Work for the new Terminal Station of the Chicago & North-Western Railway Co. at Chicago has been awarded to KOHLER BROTHERS by Messrs. Pierce, Richardson & Neiler, Engineers for the Architects, Messrs. Frost & Granger. Preference was given to this firm in recognition of the standing of

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work that is done right the first time.

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DEPARTMENT OF ELECTRICITY.

CITY OF CHICAGO.

NOTICE.

Particular attention is called to the different sections of the ordinance herein printed:
Permit must be obtained before any work is done.
The use of electric current is prohibited previous to certificate being issued.
Conditions unsafe to life or property must be corrected within forty-eight hours.

Each building into which electric current shall hereafter be introduced shall have independent service from the street or alley, entering at right angles with the street curb, except where the service wires are placed in conduits complying with the rules of the department of electricity; and no wires hereafter put up shall pass from one building to another through any party wall or along any building wall or over any roof or under any sidewalk, except where such conduits are used.

Current must not be supplied from trolley lines for motors or light except for power stations owned by company.

Temporary work must be inspected and approved before current is used.

Alterations to existing wiring must not be made without regular permit.

Permits issued by the Commissioner of Public Works for electrical work to be done on streets must be countersigned by the Department of Electricity.

Violation of any of the Sections of this ordinance constitutes a misdemeanor and renders any person, firm or corporation liable to arrest and fine of not less than $50 or more than $100, also the cutting off and stopping of current used in violation until the provisions are complied with.

William Carroll

City Electrician.

SPECIAL SUGGESTIONS TO ARCHITECTS.

The Department of Electricity will not allow more than twelve (12) sockets to be attached to one circuit.

Architects are urged to make definite specifications for electrical work, for the benefit of both the electrical contractor and the fixture contractor, specifying the number of outlets in each job for the electrical contractor to follow, and the exact number of 16-candlepower lamps to be used.

Frequently the fixture contractor installs more than twelve lights on a circuit, which is in violation of the city ordinances, and causes the consumer very much annoyance in getting electric current to his premises.

It is also suggested that the architects demand of the electrical contractor that he make up all connections and combinations relative to switches, complicated outlets, etc., leaving only two wires for the fixture hanger to make his fixture connections.

GENERAL SUGGESTIONS.

In all electric work conductors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors and securing and attaching of fittings, are especially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible, be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

SPECIAL NOTICE.

Place all service switches, meters and cut-outs, when practicable, in basements or public places where they will be readily accessible to inspectors, meter readers and trouble men, in order to obviate the necessity of interfering with tenants of apartments. It often occurs that tenants of apartment buildings who are not using electric current are annoyed by the visits of inspectors and trouble men in their necessary duties in making inspections or repairs for other tenants.

The placing of meters in basements or halls will largely do away with the annoyance caused by their disagreeable humming and it will be much more satisfactory to all concerned.



Cat. No. 4200
Weather-proof
Socket

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Sections of Revised Code of City of Chicago, Governing Electrical Inspections.

MARCH 20, 1905.

CHAPTER XXII—DEPARTMENT OF ELECTRICITY.

807. **Electric Current.**—No electric current shall be used for lighting, heating or power purposes except as hereinafter provided.

808. **Application—Contents—Permits.**—All persons or corporations desiring to install wires or other apparatus for the use of electric currents for any of the purposes mentioned in the foregoing section shall, before commencing or doing any electrical construction work of any kind whatever, either installing new electrical apparatus or repairing apparatus already in use, file an application for a permit therefor in the office of the City Electrician, which application shall describe in detail such material and apparatus as it is desired to use, with a full description of the same, giving the locality by street and number; and upon receipt of which application, if found proper, such permit shall be given.

809. **Duties of City Electrician Thereon.**—The said City Electrician shall have power, and it shall be his duty, when by him deemed necessary, to carefully inspect any such installation previous to and after its completion, and it shall be competent for him to remove any existing obstructions which may prevent a perfect inspection of the current carrying conductors, such as laths, plastering, boarding or partitions; and if such installation shall prove to have been constructed in accordance with the rules and regulations of the Department of Electricity, controlling the use of electric current, upon the payment of a fee, as herein provided, he shall issue a certificate of such inspection, which shall contain a general description of the installation and the date of such inspection. Any owner installing or causing to be installed any electric wires to be hidden from view shall, prior to such installation, give said city electrician a reasonable notice in order to give ample time for inspection. The use of electric current is hereby declared to be unlawful previous to the issuance of such certificate; provided, however, the City Electrician may issue a temporary permit for the use of electrical current during the course of construction or alteration of buildings, which permit shall expire when the electrical apparatus for such building is fully installed.

Amended June 29, 1908, to read as follows:

810. **(Certificate—Wiring Only and Complete Installations.)**—A final certificate for wiring only may be issued by said City Electrician in the case of completed wiring installation, but upon which no current shall be used in the immediate future. Such certificate shall show that at the date of inspection the installation was constructed and erected in accordance with the terms of this chapter, and shall be issued at nine-tenths the rates hereinafter named for complete installation.

Prior to the introduction of electric current into the said premises a second inspection shall be made, when, if the said installation be still in accordance with the terms of this chapter, and the fixture work be correct, a final certificate for complete installation and service shall be issued and the amount of the fee paid for the final certificate for wiring only shall be deducted from the fee for the final certificate for complete installation and service.

811. **Power of City Electrician—Inspections and Re-inspections.**—The said City Electrician is hereby empowered to inspect or re-inspect all overhead, underground and interior wires and apparatus conducting electric current for light, heat or power, and when said conductors or apparatus are found to be unsafe to life or property, he shall notify the person or corporation owning, using or operating them to place the same in a safe and secure condition within forty-eight hours. Any person or corporation failing or refusing to repair, change or remove the same within forty-eight hours, or within such further time as the city electrician shall determine is necessary, after the receipt of such notice, shall be subject to the penalty hereinafter provided.

812. **Poles—Covers—Wires—Electric Service Entrances—Switches.**—All poles now standing or hereafter erected, and all covers for manholes now in service, or hereafter placed in service for the use of electric conductors, shall be branded or stamped with the name of the person or corporation owning the same; all electric service entrances shall have attached to the conductor or conductors, in a conspicuous place, a substantial tag designating the owner, and giving such a full description of the conductors as shall meet with the approval of said City Electrician; and all of said electric service entrances shall be properly equipped with approved cut-out service switches. Each building into which electric current shall hereafter be introduced shall have independent service from the street or alley, entering at right angles with the street curb, except where the service wires are placed in conduits complying with the rules of the department of electricity; and no wires hereafter put up shall pass from one building to another through any party wall or along any building wall or over any roof or under any sidewalk, except where such conduits are used. No electric current shall be supplied from any trolley line for any purpose whatever to any building except for lighting the power stations from which current is supplied to such trolley lines.

Amended June 29, 1908, to read as follows:



The Western Electric Co. Furnishes Equipment for Every Electrical Need



The significance of this to every Architect and Builder is that it places at his ***immediate disposal*** a complete line of electrical equipment of the highest quality. We are the largest manufacturers and distributers of Telephone Apparatus and Miscellaneous Electrical Supplies in the world.

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Consulting and Contracting

Electrical Engineers

Office:

172 Washington Street, Chicago

Telephone Main 3410

§13. **Fees.**—There shall be collected by the City Collector for completed installations, prior to the issuance of certificate permitting the use of electric current, the following fees, in the following manner:

For the inspection of each of the first two arc lamps, one dollar; for three arc lamps, two dollars and eighty cents; for four arc lamps, three dollars and sixty cents; for five arc lamps, four dollars and forty cents; for six arc lamps, five dollars and ten cents; for seven arc lamps, five dollars and eighty cents; for eight arc lamps, six dollars and fifty cents; for nine arc lamps, seven dollars and twenty cents; for ten arc lamps, seven dollars and ninety cents; for above ten to twenty arc lamps, sixty cents each; twenty arc lamps, thirteen dollars and ninety cents; for above twenty to thirty arc lamps, fifty cents each; for thirty arc lamps, eighteen dollars and ninety cents; for above thirty arc lamps, twenty-five cents each.

For incandescent lamps consuming nominally fifty watts each, as follows: For each of the first twenty-five incandescent lamps, ten cents; for each of the next twenty-five lamps, nine cents; for each of the next twenty-five lamps, eight cents; for each of the next twenty-five lamps, seven cents; for each of the next one hundred lamps, six cents; for each of the next one hundred lamps, five cents; for each additional lamp above three hundred, four cents; and for larger and smaller lamps under five hundred watts in the same proportion.

For the inspection of incandescent lamps consuming five hundred watts and over: For each of the first two lamps, one dollar; for each of the next three lamps, eighty cents; for each of the next five lamps, seventy cents; for each of the next ten lamps, sixty cents; for each of the next ten lamps, fifty cents; for each additional lamp above thirty, twenty-five cents.

For each electrical horse power of seven hundred and forty-six watts used for mechanical or other purposes than above mentioned, the sum of one dollar for each horse power from one to five horse power, inclusive; for each of the next succeeding five horse power, seventy-five cents; for each of the next succeeding five horse power, sixty-five cents; for each of the next succeeding ten horse power, fifty-five cents; for each of the next succeeding twenty-five horse power, fifty cents; for each of the next succeeding two hundred horse power, twenty-five cents; for each of the next succeeding two-hundred and fifty horse power, ten cents; for each additional horse power, five cents.

Arc Lamps and Incandescent Lamps of 500 Watts and Over.	Each
2 lamps @ $1.00, $2.00; above 2 lamps to 5 @	80c
5 lamps 4.40; above 5 lamps to 10 @	70c
10 lamps 7.90; above 10 lamps to 20 @	60c
20 lamps 13.90; above 20 lamps to 30 @	50c
30 lamps 18.90; above 30 lamps @	25c

Incandescent Lamps.

For incandescent lamps consuming nominally fifty watts each, as follows:	Each
25 lamps, $2.50 ... above 25 to 50 lamps @	9c
50 lamps, 4.75 ... above 50 to 75 lamps @	8c
75 lamps, 6.75 ... above 75 to 100 lamps @	7c
100 lamps, 8.50 ... above 100 to 200 lamps @	6c
200 lamps, 14.50 ... above 200 to 300 lamps @	5c
300 lamps, 19.50 ... above 300 @	4c

For larger and smaller lamps under five hundred watts in the same proportion.

No inspection shall be made for a less amount than one dollar.

Inspections of electric lights other than electric signs as herein defined, placed on a public street or alley for the purpose of illuminating the same, temporary installations for show window exhibitions, conventions and the like, shall be charged for according to the time required for such inspections at the rate of seventy-five cents per hour.

Each reinspection of any overhead, underground or interior wires or apparatus shall be charged for according to the time required for such reinspection at the rate of seventy-five cents per hour.

On each installation where a permit has been issued and work not sufficiently completed within three months for wiring only certificate to be issued, and where inspection has been made on such work, a portion of the regular fee must be charged to cover the cost of such inspection, which will be credited on the final certificate.

Immediately after the inspection provided for in Section 809, the City Electrician shall make a fee bill, in duplicate, on a form to be approved by the City Comptroller, and shall forward the same to the Comptroller to be recorded and rendered. The person, or corporation, receiving the fee bill, shall pay the amount thereof, to the City Collector, who shall endorse payment thereon and enter the fee bill and payment in a book in his office, to be provided for that purpose, and thereupon the City Collector shall deliver the paid fee bill to the person, or corporation, paying the same. The paid fee bill shall then be presented to the City Electrician at his office and thereupon the City Electrician shall issue the wiring only or final certificate for completed in

stallation provided for in Section 810.

814. **Alterations.**—No alterations shall be made in any electrical installation without first notifying the said City Electrician and submitting the same for inspection in the same manner as provided for new work.

815. **Penalty.**—Any person or corporation furnishing or using any electric current within the city, in violation of any of the provisions of this chapter, or contrary to any of the rules and regulations of the Department of Electricity, shall be fined not less than fifty dollars nor more than one hundred dollars for each offense, and each day's use thereof contrary to the provisions of this chapter shall constitute and be a separate and distinct offense. Said City Electrician may, for any violation of the provisions of this Chapter, also order and compel the cutting off and stopping of such current until the provisions of this Chapter are fully complied with.

Table of Carrying Capacity of Wires.

B. & S. G.	Concealed Work. Amperes.	Open Work. Amperes.
18	3	
16	6	
14	12	19
12	17	24
10	24	32
8	33	43
6	46	57
5	54	63
4	65	74
3	76	83
2	90	98
1	107	117
0	127	140
00	150	157
000	177	185
0000	210	225

Table of Carrying Capacity of Wires.—Continued.

Circular Mills.	Concealed Work. Amperes.	Open Work. Amperes.
200,000	200	
250,000	235	285
300,000	270	355
350,000	300	377
400,000	330	415
500,000	390	485
600,000	450	545
700,000	500	600
800,000	550	655
900,000	600	719
1,000,000	650	765
1,100,000	690	
1,200,000	730	
1,300,000	770	
1,400,000	810	
1,500,000	850	
1,600,000	890	
1,700,000	930	
1,800,000	970	
1,900,000	1,010	
2,000,000	1,050	

The lower limit is specified for rubber-covered wires to prevent gradual deterioration of high insulations by heat of wires, but not from fear of igniting the insulation. Question of drop is not taken into consideration in above tables.

The carrying capacity of sixteen and eighteen wire is given, but no smaller than fourteen is to be used, except as allowed under Rules 24 *u* and 40 *c*.

Materials.

The following is a list of non-combustible, non-absorptive, insulating materials for the benefit of those who might consider hard rubber, fiber, wood and the like as fulfilling the requirements.

1. Glass.
2. Marble (filled).
3. Slate without metal veins.
4. Porcelain, thoroughly glazed and vitrified.
5. Pure Sheet Mica.
6. Lava (certain kinds of).
7. Alberene Stone.

Electric Gas Lighting.—

Electric gas lighting must not be used on the same fixture with the electric light.

816. **Electric Lighting Facilities Indemnity.**—The city electrician is authorized to execute and deliver in the name of the city of Chicago to any person or corporation affording facilities for any of the city's electric lighting property, contracts of indemnity to hold such person or corporation harmless from all injuries, damages or expense to any persons or property arising in any way out of the city's exercise of such facilities, when such facilities are not afforded under the requirements of ordinances held by them.

818. **City Electrician in Control.**—The City Electrician shall have charge and control of and shall erect all lamp posts and lamps, and street signs designating the names of the streets which shall be placed on said lamps.

GAS FITTERS' RULES

Of the Peoples Gas, Light and Coke Company.

OFFICE BUILDINGS, DWELLING HOUSES AND FLATS. MANUFACTURED GAS FOR LIGHT.

The following tables show the size and length of Pipe allowed:

Size of Pipe.	Greatest Length Allowed.	Greatest Number of ⅜" Openings Allowed.	Size of Pipe.	Greatest Length Allowed.	Greatest Number of ⅜" Openings Allowed.
⅜ inch	20 feet	2 openings	1½ inch	150 feet	60 openings
½ inch	30 feet	3 openings	2 inch	200 feet	100 openings
¾ inch	60 feet	10 openings	2½ inch	200 feet	200 openings
1 inch	70 feet	15 openings	3 inch	300 feet	300 openings
1¼ inch	100 feet	30 openings			

STORES, HOSPITALS, SCHOOLS, FACTORIES, ETC. GAS FOR LIGHT.

Size of Pipe.	Greatest Length Allowed.	Greatest Number of ½" Openings Allowed.	Size of Pipe.	Greatest Length Allowed.	Greatest Number of ½" Openings Allowed.
½ inch	20 feet	1 opening	1¼ inch	100 feet	20 openings
¾ inch	60 feet	8 openings	1½ inch	150 feet	35 openings
1 inch	70 feet	12 openings	2 inch	200 feet	50 openings

For stores the running line to be full size to end of last opening.
All drops to be ½ inch with set not less than 4 inches.
Twenty feet of ⅜-inch pipe allowed only for bracket lights.

Window lights to be ½ inch.
Drops in churches, schools, public halls, stores, double parlors, large rooms and halls of office buildings, etc., should be not less than ½ inch for each 168 square feet of floor space.

BUILDING SERVICES.

In running service pipe from front wall to meters the following rules will apply:

Size of Opening.	Greatest Length Allowed.	Greatest Number of ¾" Openings Allowed.	Size of Opening.	Greatest Length Allowed.	Greatest Number of 1" Openings Allowed.
1 inch	70 feet	1 opening	1½ inch	150 feet	5 openings
1¼ inch	100 feet	3 openings	2 inch	200 feet	8 openings

All openings in service must be equal to the size of riser, which in no case must be less than 1 inch.

MANUFACTURED GAS FOR FUEL.

Size of Pipe.	Greatest Length Allowed.	Greatest Number of ¾ Openings Allowed.	Size of Pipe.	Greatest Length Allowed.	Greatest Number of ¾ Openings Allowed.
¾ inch	50 feet	1 ¾-in. or 2 ½-in.	1½ inch	150 feet	7 or 4 ¾-in. and 6 ½-in.
1 inch	70 feet	2 or 1 ¾-in. and 2 ½-in.	2 inch	200 feet	15 or 8 ¾-in. and 14 ½-in.
1¼ inch	100 feet	4 or 2 ¾-in. and 4 ½-in.			

For mantels, grates and small heating appliances, for heating space not to exceed 1,728 cubic feet, thirty feet of ½-inch pipe is allowed for one opening only, and two such openings are considered as one ¾-inch opening.

RESIDENCE OR FLAT OF 12 ROOMS OR UNDER.

Kitchen opening—not less than ¾ inch.
Laundry opening—not less than ½ inch.
Fire-place opening—not less than ½ inch.

All Ruud, Monarch, and Humphrey water heaters, and other heaters of this type, should be provided with separate runs as provided in the following table:

Humphrey	Monarch	Pittsburg	Ruud	Size of Pipe
No. 3A	No. 0	No. 3	No. 3	1¼
No. 4A	No. 1	No. 4	No. 4	1½
No. 6A or 6B	No. 2	No. 6	No. 6	2
No. 8B	No. 3	No. 8	No. 8	2

RESIDENCE OR FLAT OF 13 ROOMS OR OVER.

Kitchen opening—not less than 1 inch.
Laundry opening—not less than ¾ inch.
Fire-place opening—not less than ½ inch.

GAS ENGINES.

Supply for gas engine must be separate. An independent service will be required, and a governing-holder or other similar device acceptable to the Company must be used.

It is advised that before proceeding with the installation of gas engines, or piping for same, consultation be had with Gas Company.

The Lighting Problem

The strongest evidence that we can advance in support of our contention that ***every Building*** should be piped for gas during construction can be found in our records, showing that we are sooner or later called upon to furnish gas to occupants of most every building in the city.

We can prove that the builder who for special reasons leaves gas out of his specifications, eventually changes his plans and uses or rents his building for a purpose it was not originally built for.

When it is finally necessary to install gas it means a lot of tearing up of floors and walls, and a loss of time and money to all concerned.

For this reason it is clearly a matter of plain economy to have every building piped for gas during process of construction.

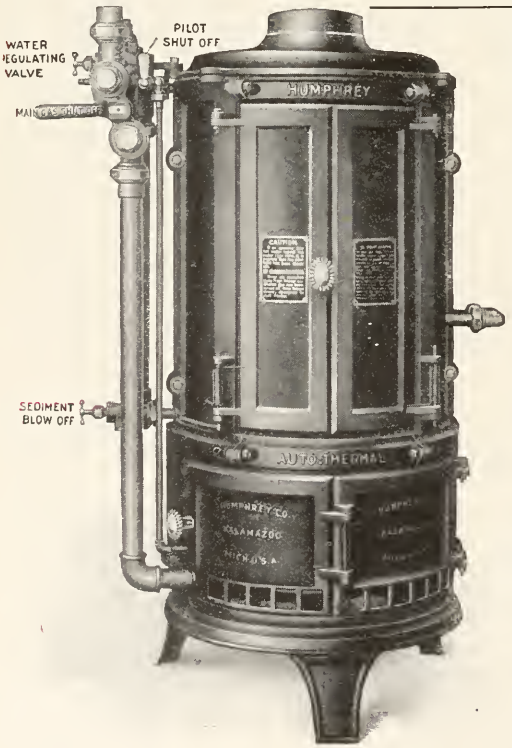
We will be pleased to send one of our engineers ***free*** of charge to consult with any architect or builder in regard to special requirements, proper appliance or installation problems.

Gas burned in modern appliances will furnish a larger volume and more satisfactory light, heat and power for the money than will any other method.

Please remember that our experts
are at your service.

THE PEOPLES GAS LIGHT & COKE CO.

Peoples Gas Building, Michigan Blvd. Telephone Randolph 4567



HOT WATER SERVICE

the kind you have always wanted, is supplied by Humphrey Automatic Water Heaters.

¶ They supply cheaply, at any time, instantly heated hot water to every faucet in a building.

¶ Entirely trouble free. Operated entirely by opening or closing a faucet. Guaranteed.

Made by

HUMPHREY COMPANY

Kalamazoo :: Michigan

CHICAGO STORE, 343 Michigan Avenue, Opposite 12th Street Station

Displayed by

Peoples Gas Light & Coke Co.

At Adams and Michigan, and at all Branch Stores.

Size of Engine.	Size of Pipe.	Greatest Length Allowed.	Size of Engine.	Size of Pipe.	Greatest Length Allowed.
1 H. P.	1 inch	60 feet	7 H. P.	1½ inch	100 feet
2 H. P.	1¼ inch	70 feet	12 H. P.	2 inch	140 feet
5 H. P.	1½ inch	100 feet			

SPECIAL NOTICE.

Gas fitters are requested to inform customers moving from one location to another that it is necessary to apply at the office of the Gas Company to have gas shut off at old and turned on at new address. This will prevent anyone using gas in their name at old location, and will also relieve them of any responsibility for bills of former tenant at new address.

This Company does not permit anyone but its own authorized employes to place any piping or connections on any part of either the outlet or inlet meter connections, turn on the gas, disconnect, move, or interfere in any way with its piping, meters or connections.

If meters are connected and customer desires to make alterations in house piping, and if to make such alterations it is necessary to disconnect meter, then the customer is required to call at the Main Office, 155 Michigan Avenue, and sign an order for the disconnection of meter, and for the resetting of it after the alterations in house-piping have been made. All charges for work of this character are payable with order.

CONNECTING APPLIANCES.

Fitters are particularly requested to see that all gas-burning appliances are connected solid with iron pipe. Under no circumstances will this Company approve of the use of lead pipe or rubber tube.

SUMMARY.

When risers are located in rear of basements or in rooms provided for that purpose, or on different floors, the building service must be brought to front of building and within 18 inches of the front wall or partition. Old or new buildings that have no basements, or in basement flats where the building service pipe is extended to the front wall over or under the joists, before floor is laid, it will be necessary for the fitter to run pipe through foundation wall, about 18 inches below the sidewalk level and 18 inches outside of wall, at a point where street service may be connected to building service, clear of walks or other obstructions.

When new piping is installed in old buildings for illumination, an independent pipe should be run for fuel, to be connected to light riser at meter end with union or right and left coupling.

Ends of openings for fuel for kitchen must be 3 inches above floor and 2 inches clear of baseboards.

Openings for mantels or fireplaces must be ½ inch above finished bottom of fireplace and 6 inches from side or back.

Drops must be extended 1½ inches below unfinished ceilings or ⅝ inch below finished ceilings.

Openings for vestibule, public hall and basement light in two flat buildings or over, should be taken from an independent pipe, an opening left on building service, so a separate meter may be set for hall and basement lights, or riser may be connected with union or right and left coupling to meter of the applicant, who may wish to pay for the gas used.

When running pipe for exit lights in theatres, schools, amusement and assembly halls, refer to the city building ordinance.

To avoid trapping, gas fitters must grade all pipe to riser or drops.

Branches or cross-lines of pipe from the main line must have a set not less than 4 inches dropped square, and must be well secured to joist by gas-hooks or galvanized straps.

Openings must be closed with iron caps, no split pipe or broken fittings repaired with cement or lead will be allowed.

Drops on branch lines and openings for side brackets must be square bends; no nipples allowed.

Meters will not be set where they are not easily accessible, or where they are exposed to frost or dampness, or liable to injury from any cause.

In all cases where extensions are made, care must be taken to break pipe where the size can be maintained, and in no case shall extension be made from small pipes.

Cast-iron fittings, bushings or unions concealed at any point away from the service or riser connection are not allowed. The risers in buildings must in no case be less than ¾ inch and must be run inside of inside partitions, not closer than 4 feet to any outside wall and must not extend lower than 1½ inches below a finished ceiling and 2 inches below an unfinished ceiling and should not be higher than 9 feet from floor. Vestibule to be considered as an outside partition. The end of risers in stores must not be located under deck or bulkhead of show-window, or over any side openings for gas or electric light.

Risers for residences or apartment buildings must not end in stairway closet, or in bedroom closets or under sinks, washstands, sidewalks, bedrooms, under enclosed stairway, over side lights, over toilet stools in way of flush tank, or in basement less than 6 feet high.

In apartment buildings it is desirable to set meters in the basement or in a room provided for the purpose. If they are to be set on different floors, location should be provided so that they may be accessible without entering the apartments. Do not locate risers in laundry, furnace, or boiler room.

Risers in any building must not be less than:

2 feet from floor for 2 to 10 openings;
2 feet 6 inches from floor for 10 to 30 openings;
4 feet from floor for 30 to 60 openings;
5 feet from floor for 60 to 100 openings;
6 feet from floor for over 100 openings.

The Company reserves the right to determine in all cases the location of the meters.

In new or old buildings an opening should be provided for service pipe to pass through walls when same are being constructed. The most preferable way would be to build a sleeve of wood, rectangular shape, 12 inches by 5 inches with an inside partition about 6 inches from the street end of sleeve. Application should be made to the Superintendent of Distribution at the Gas Company's main office to locate the wall where the sleeve should be built in, so that when service pipe is run it will pass through the opening provided for it. In this way the damaging of foundation walls will be avoided.

When pipes pass through masonry, pipes must be encased, the gas-pipe resting on the

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Lowest Market Prices



Generators and Distributers of

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Commonwealth Edison Company

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TELEPHONE

into consideration when planning or building. Our Chief Engineer will lend his assistance in drawing conduit plans which will save you time and expense. See page 201.

Call Main 294
Local - 141

Chicago Telephone Co.

203 Washington Street

bottom of the casing-pipe, with a clearance of one-half inch on top.

In all cases where pipe is to be imbedded in concrete or cement the pipe should be covered with tar paper or other suitable covering, or laid in conduit pipe.

To avoid complications, gas fitters should consult the Company before locating risers in corner buildings.

Hotels, boarding houses, restaurants, etc., should be considered special work.

Opening at meter end where risers are connected must be one size larger than the largest sized riser.

The extension of service-pipe from front to rear building should not be of less than 1½ inch size.

BUILDING SERVICES.

In double flat buildings having but one entrance, fitters are required to extend service from various headers to the front wall and connect same, the opening for street service to be one size larger than the largest size in building service. Terminate same at front wall so that street service may be run clear of private walks or other obstructions.

In apartment buildings, one building service extended from the different group of risers to the front wall of building will answer, provided access to the different group of risers can be obtained inside of basement proper, otherwise an independent service should be extended to front wall.

STORES.

Buildings containing stores only should have a separate service for each store.

When riser ends in rear of store an independent service should be extended to front wall of basement. If there is no basement under building, fitter to run pipe through foundation wall about 18 inches below the sidewalk level, and 18 inches outside of wall at a point where street service may be connected to building service clear of walks or other obstructions.

Underground work by gas fitters between main and meter will not be accepted.

In flat buildings where appliances are installed for the joint use of tenants, such as laundry stoves, driers, etc., run pipe from each tenant's meter to laundry and provide a header with a lock-cock for each tenant. Fasten securely to each cock a metal tag with the flat number plainly marked thereon. An opening for light in laundry may be taken from end of laundry header.

Work must be proved with mercury gauge, not less than a six-inch column of mercury being allowed.

It is the purpose of this Company strictly to enforce the above rules, and no certificate of inspection will be given when they are not complied with.

Architects, builders and owners of buildings are requested not to allow bill for gas fitting unless accompanied by a certificate of inspection.

SUGGESTIONS FOR THE PROVISIONS OF WIRING AND CABLING OF BUILDINGS FOR TELEPHONE SERVICE.

The extensive use of the telephone at the present time in all classes of buildings, renders it imperative that some provision be made for the large number of wires necessary to provide telephone service.

A pair of wires are necessary for each telephone, and these wires must be carried to some central point in the building. The importance of making adequate provision for this service within the finish of the building is apparent. If some arrangement is not included in the building plans open wire runs will be necessitated, and alterations will have to be made after the completion of the building.

The following is a brief outline of satisfactory schemes of wiring various buildings. This is submitted for the information of Architects and builders.

In general, the wiring of buildings of each class will be uniform. On account of the conditions varying in each building with respect to telephone service, the probable requirements must be estimated as closely as possible. The Telephone Company will be pleased to give their service in advising owners and architects in this connection. With reference to wiring for telephone service, buildings may be divided into general classes.

First: Hotels, hospitals, clubs and apartment houses.

Second: Office buildings, commercial houses and factories.

The characteristics that make a broad distinction between the wiring of these two classes are as follows:

In Class No. 1 a maximum number of telephones in any one room or on any floor is definitely fixed. The whole building may thus be permanently wired.

In Class No. 2 the wiring of buildings for telephone service presents a more difficult problem, for the following reasons:

The number of telephones will depend largely upon the character of the business and district. The number of telephones on any floor of these buildings will depend upon the requirements of the individual tenants. This is not constant for any extended period, as tenants may from time to time be replaced by others using more or less service.

Hotels, Club Houses, Hospitals, Commercial Houses, and Factories.—The telephone system installed in these buildings consists of a telephone switchboard and cross connecting box located at some convenient point, usually on the ground floor in or near the office. The telephones are placed at the desired locations and wired to the cross-connecting box, which is connected by one or more trunk lines with the nearest

exchange of the telephone company; thus provision should be made so that the telephone company can run these trunk lines to the above box from the point at which the service cable enters the building. A 2-inch conduit is sufficient for this purpose. One or more distributing boxes are provided on each floor. These boxes should be placed in the walls above the baseboard, and a conduit extended to the cross-connecting box. In hotels, hospitals and clubs the telephone conduit consists of an outlet box placed in each chamber. The present practice is to loop an average of ten outlets and extend a large conduit to the distributing boxes, thus the conduit tapers down to a ½-inch conduit, at the last outlet. In commercial houses and factories the system of distributing conduits in general is the same as mentioned above. It briefly consists of outlets placed in the baseboard of each or every other column, or of floor boxes placed at 5-foot centers. Distributing boxes should also be provided on the various floors, and conduit installed to the cross-connecting box. This cross-connecting junction box is used for connecting the house cables and service cable with the switchboard. Several 2-inch conduit or cable runways should be installed between the switchboard and cross-connecting box in order to convey the switchboard cables between the above points.

Office Buildings.

In office buildings the service cable is brought into the building through a sub-duct from the vault in the street or alley and extended to the cross-connecting box, which is located at some convenient place in the basement near the telephone wire shafts One or more distributing boxes, depending upon the floor area, are established on each floor, at points adjacent to the telephone shafts. From the cross-connecting box cables are extended to and up the shafts to the distributing boxes. The house cables and service cables are terminated in the cross-connecting boxes, so that connections can be made between the two sets of cables.

REGULATIONS GOVERNING COMMONWEALTH EDISON CO.'S SYSTEM.

INSPECTION.

All wiring which is to be connected to the mains of this Company must be installed in accordance with the rules and requirements of the Department of Electricity of the City of Chicago and the Chicago Underwriters' Association. A "certificate for installation" or "temporary current permit" from said Department of the City must be presented at the office of the Inspection Department of this Company before current can be used on any wiring for which such certificate or current permit has not been issued. When wiring has been installed for additional lights or power, this certificate or current permit must also be presented as in the case of an original installation. The Company should be notified whenever any additional apparatus is desired to be connected to consumer's wiring in order to avoid interruption of consumer's service and injury to the Company's meters or other apparatus. The Company will make the final connection of all wiring to its mains.

DIRECT CURRENT TERRITORY.

Current is supplied from the Edison three-wire direct current system in approximately the following territory:

South of Menomonee Street east and north of the Chicago River,

West from the Chicago River to Morgan Street between Kinzie Street and Twenty-second Street, except on Milwaukee Avenue, where the direct current extends to Wood Street; on West Madison, where it extends to Ashland Ave., and on Blue Island Avenue, where it extends to Throop Street.

In the "down town" district. On the south side to Thirty-fifth Street between Stewart Avenue and Cottage Grove Avenue.

From Thirty-fifth to Thirty-ninth between Dearborn Street and Grand Boulevard, and on Cottage Grove Avenue from Thirty-fifth to Thirty-eighth Streets.

ALTERNATING CURRENT TERRITORY.

Current is supplied from the alternating current Edison three-wire system for lighting and small power in all parts of the City, other than those above described, where the Company has lines.

Current is supplied for power from the three-phase system in a large part of the alternating territory, but inquiry should be made of the Inspection Department at the nearest district office as to the proximity of three-phase lines to any particular location where power may be desired.

SERVICES.—UNDERGROUND.

The consumer's wiring must be extended to the Company's nearest service where sidewalks are excavated and provided with the necessary service switch and cut-outs, unless the premises in which current is to be used are more than 50 feet from the

nearest service. In this case, application should be made to the Company to have a service installed.

In case it is necessary to extend service inside of the property line in order to reach the building, the expense of the installation of the portion inside the property line must be borne by the consumer. Final connection of the wiring to the service will be made by this Company in all cases.

OVERHEAD.

The consumer's wiring must be brought outside the building wall at some point at least 25 feet above the ground, so located that it will be readily accessible to service wires brought from the Company's nearest pole. In case the pole line from which service is to be given is not in position at the time interior wiring is being done inquiry should be made at the district office for information as to its proposed location.

Inside wiring must not be brought out of the building in an inclosed air shaft, as the City ordinance forbids the erection of wires across a roof to reach wires in such a place.

The location of service outlets on a party wall is also forbidden by City ordinances.

ALTERNATING CURRENT MOTOR AND ARC LAMP.

On the alternating current system, separate services will be provided as follows:

For motors of one horse-power or larger and for arc lamps where a large installation is made.

Inquiry should be made of the Inspection Department in all cases where more than ten alternating arc lamps are being wired, as to whether incandescent and arc lamps may be wired to the same service.

Separate mains and meter loops are of course necessary for all wiring fed by separate services.

METERS.

Meter loops must be provided in the mains at an accessible point, and so arranged that the meter may be mounted with ordinary wood screws on the wall. A meter board must be provided of sufficient size to allow the installation of a recording watt meter and maximum demand meters. Two demand meters are installed on three-wire mains. Sufficient space must be provided about the meters to allow the removal of the case. Meter loops should not be placed above seven feet from the floor.

In office buildings meter loops should be located at a central point in meter closets or public corridors, and in apartment buildings in the basement of the building, so that meters may be installed and maintained without annoyance to tenants.

MOTORS.

Wiring for motors should be so arranged that the current used for power purposes may be metered separately from that used for lighting. Wiring for elevators should also be arranged so that current used on elevators may be metered separately from that used for other power.

All motors larger than 1 horsepower must be wound for 220 volts, and it is preferred that motors of three-fourths horsepower and larger be so wound.

Alternating current motors must be designed to operate at a frequency of 60 cycles.

No motors larger than 5 horsepower will be supplied on single-phase system, except by special permission, given by the Inspection Department of the company in each case.

Motors of 5 horsepower and larger will be supplied on the three-phase system at 60 cycles, 220 volts.

No motor will be connected which requires more than three times full load current in starting without load.

INCANDESCENT LAMPS.

Standard shape Edison base incandescent lamps will be furnished free of charge for installations and renewals, unless otherwise provided for by the terms of the contract, in 4, 8, 10, 16, 24, 32 and 50 candle-power sizes.

One lamp will be furnished for each socket installed in the customer's premises at the time the installation is made. Additional lamps will be furnished at any time when additional sockets have been wired. A reserve supply of lamps, equal to approximately 10 per cent of the customer's total installation, will be advanced for convenience in making renewals. When burned out or blackened, lamps will be renewed free of charge (except special lamps) upon presentation of the old lamps with glass intact at the nearest lamp renewal station, or lamps will be delivered to customers' premises on request.

All lamps furnished for installation, reserve or renewal remain the property of the company. The consumer must, therefore, give his receipt for all lamps delivered to him for installation, reserve or renewal, agreeing to pay for lamps unaccounted for at 20 cents each.

ARC LAMPS.

Arc lamps having a standard black finish are provided by the company for the consumer's use free of charge. Lamps having ornamental finish will be supplied only at an extra charge.

Lamps furnished by the company will be cleaned and trimmed by the company free of charge when used for general lighting purposes. Arc lamps used for photographing or other purposes than general illumination must be provided and maintained at the consumer's expense. A hanger board must be provided for use in hanging inside lamps and a suitable crane provided with a hook must be provided for outside lamps. They must be installed so that the bottom of the lamp will not be less than eight feet above the ground when it is hung, the length of the lamps being about 40 inches. If it is necessary to install lamps beyond the reach of a six-foot step-ladder, some arrangement must be made for lowering the lamp so that it may be trimmed.

See section on "Services" for special regulations regarding alternating arc lamps.

SOME SUGGESTIONS ON WIRING SPECIFICATIONS.

By Fred J. Postel.—Consulting Engineer.

Always state whether the wiring is to be for direct or alternate current. If alternating current is to be used and the wiring installed in iron conduit, all the conductors of any one circuit must be enclosed in the same conduit. As any system of wiring may at some future time be changed from direct to alternating current, it is best to so install the wiring that it will be correct for both.

Always specify what grade of wire is to be used, and during construction examine the wire as it is being installed, to satisfy yourself that the wire specified is actually being used. Generally speaking, it might be said that there are two kinds of wire, "Code wire," and "high grade" wire, although naturally, there are different grades of "Code wire," and different grades of "high grade wire." The Underwriters have fixed a certain minimum standard which all wire must meet to be "approved." The so-called "Code wire" is made to just meet these requirements, while "high grade" wire not only meets these requirements, but goes beyond them in insulating qualities. The copper conductor is of the same quality in both cases, the only difference in the wires being in quality of the insulation. The difference between the two kinds may readily be distinguished by the following crude test: Cut a piece of insulation off the wire and stretch it. Code wire is soft and mushy, with little "life," and will break without even a "snap." The insulation of high grade wire, on the other hand, will stretch more or less, and when it breaks, snaps back into its original form. Code wire insulation contains but small quantities of pure rubber, while the insulation of high grade wire contains considerably greater quantities, the exact amount varying in different brands. On account of the fact that the cost of wire is but a comparatively small part of the total cost of a wiring installation, the total net difference in cost between an installation of high grade wire and Code wire will be between 5 per cent and 10 per cent of the total cost of the installation, even under the present high prices of rubber.

It must be kept clearly in mind that the voltage of a circuit has a direct bearing on the quality of the insulation of the wire, and that the higher the voltage, the better the insulation must be. On the other hand, the amperes in the circuit have a direct bearing on the size of the copper conductor—the greater the current, the larger the size of wire required, and vice versa.

Branch circuits must never be less than No. 14 wire. Wires must never be loaded beyond the capacity given in the tables prepared by the Underwriters, and given herewith. It may be found that sizes given in the table will result in an excessive drop in voltage, in which case the size must be increased. A simple formula for figuring the size of wire for direct current circuits is as follows: Circular mills $= \frac{D \times 2 \times 10.7 \times A}{V}$

in which D is the distance to the end of the circuit in feet, A equals the amperes of the circuit, and V equals volts lost.

It should be remembered in applying this formula that two volts difference of potential between any two lamps in the building is the maximum allowed in good practice.

For the ordinary circuit wiring met with in laying out the wiring of the average building, this formula is sufficiently accurate for alternating current circuits, as well.

The location of every outlet should be shown on plans and by the use of symbols it should be indicated whether outlets are combination gas and electric, or electric only. The circuits should also be shown on the plans so that the contractor will know which lights are to be grouped together, as well as the switching arrangements that will be required.

The wiring contractor should be required to properly assemble all the leads in any one outlet box, leaving just two ends for the fixture contractor to make his connections. Wiring contractor should test out the circuits on completion of his work, to insure their being free from grounds and short circuits, and to determine whether switch and fixture outlet connections are properly made.

Circuits must be laid out with not over 12 sockets or receptacles to a circuit. It is better to install not more than 10 to any one circuit, so as to allow for future extensions and possible change in fixtures or style of lamps.

Branch circuits must be fused for not to exceed six amperes on 110 volt service, and three amperes on 220 volt service.

Edison fuses are permitted only on circuits

of not over 125 volts, and not over 15 amperes.

Link fuses should have copper tips stamped with the rating in amperes.

Fuses of all kinds should always be installed in dust proof and fire proof cabinets.

Wherever fuses are installed, a separate fuse must be installed on each wire of the circuit.

Single pole snap switches must not be used to control more than six 16 c. p. lights, or their equivalent. Where the use of double pole switches does not involve much expense on account of extra wire, their use is recommended, as they entirely disconnect all the wires on the fixture side of the switch, while single pole switches disconnect only one side. Where more than six 16 c. p. lights, or equivalent, are controlled by one switch, double pole switches must be used.

Where it is desired to control lights from two or more points, the wiring should be installed as indicated in the cut. Where lights are controlled from two points only, two three-way switches are used, while the four-way switch is omitted. As many additional points of control as are desired may be had by installing that number of four-way switches, connected as the one in the cut is connected. As three and four-way switches are single pole, they may be used to control not to exceed six 16 c. p. lamps.

Where wiring is concealed it should always be run in iron conduit. Some cities still permit concealed knob and tube work, but even where so permitted by the authorities, it should not be used.

Exposed wiring may be either open work, wood moulding or metal moulding.

Flexible metallic cable may be used for "fishing" in old buildings, where a conduit installation would require extensive cutting and tearing up of plaster and wood work.

Where conduit is specified, particular care must be used in the smaller cities, where there is no supervision by the municipal authorities, that ordinary iron pipe is not substituted for conduit, by the contractor.

The ends of the conduit must be carefully reamed to remove all burrs resulting from cutting the pipe. Conduit runs should always end in an outlet box, Condulet, Taplet or other similar metal terminal box.

It is advisable to install ½-inch conduit between all points where it is likely that telephone wires will be installed later on, and this conduit work should be included in the wiring specification.

The wiring specifications should include the service leads run in conduit from the outside of the building at a point at least 15 feet above the ground line (where public service is on poles), to the basement, vestibule, or other point readily accessible to meter readers or repair men. At this point the service switch should be installed, meter loops left and the service continued to junction boxes, cutout boxes, etc.

Meter boards of sufficient size to receive the number of meters required should be installed at the point where the meters are to be located. The central station company will set the meters, but the meter board and meter loops should be included in the wiring specifications.

In residences and other cases where only one tenant will occupy the premises, meter loops should be left for one meter only, and the service should be run from the meter directly to the cutout box.

Cutout boxes, whether in residence or flat building work, should be so located that the wiring contractor or repair man can reach them with minimum inconvenience to the tenant, but on the other hand, the cutout box must not be located too far from the center of the load. It must be kept in mind that inasmuch as each circuit must be carried to the cutout box, the nearer this box is to the center of the load, the less will be the cost of installing the wiring.

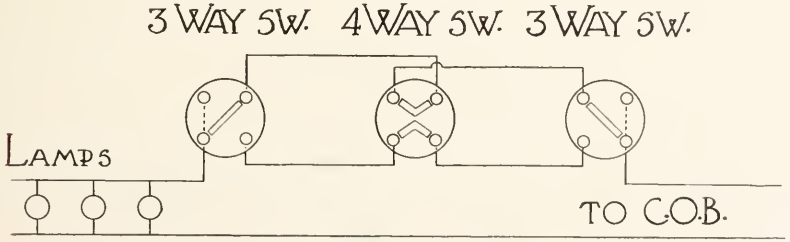
In flat buildings, where a number of tenants will be supplied from the same main service, a branch service lead should be carried from each meter to a cutout box supplying one tenant.

Where any one tenant has a large number of lights, it may be found desirable to install two or more cutout boxes, in which case one service lead may supply all of the cutout boxes, or the service lead may run to a junction box and there divide, one branch running to each cutout box. Local conditions will determine which method is best to follow. In any case, specifications should always state the number and location of cutout boxes, and the plans should indicate the circuits by which these boxes are connected to the meter.

In office buildings or other cases, where a number of tenants may be supplied from one cutout box, it is often advisable to install a "Metering Panel." Such a panel will simplify the wiring in the cutout box to a great extent.

Cutout boxes may be of wood lined with asbestos, slate or marble, except where used in connection with conduit work, in which case they must be metal lined. High grade construction requires metal cutout boxes in any case, although these boxes may be given a glass or ornamental wood door, provided, of course, that the wood, if used, be protected by the metal.

☞*NOTE—See page 196 City Electrical Regulations for Table of Carrying Capacity of Wires.*



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RULES OF MEASUREMENT FOR EXCAVATION AND CONCRETE WORK.

The following rules have been carefully studied and analyzed by a joint committee consisting of five (5) members of the Chicago Architects Business Association, five (5) members of the Western Society of Engineers, and five (5) members of the Contractors' and Masons' Association of Chicago.

If any new rules or new applications of old rules should be found in the following, we can only say for their recommendation that we have carefully considered them in all their bearings, endeavoring to secure equal justice to owner as well as contractor, and that they will form the standard for deductions as well as for compensation for extra work.

EXCAVATION OF CELLARS AND BASEMENTS.

1. Excavation to be measured and computed by the actual amount of material displaced. If unit price is based upon loose measurement add forty (40%) per cent to actual bank measurement, except if consisting of sand and gravel, when only twenty (20%) per cent will be added. If rehandling becomes necessary, same to be done at a special price agreed upon in addition to the above.

EXCAVATION OF TRENCHES AND PITS.

2. Excavation of trenches, pier holes, or pits when more than 3′ wide to be computed on actual contents when less than five (5′) ft. deep.

When less than three feet wide excavation of trenches, pier holes, or pits to be computed on actual contents if less than two (2′) feet deep.

If more than two feet (2′) deep compute contents of trench on base of three foot (3′) width, even though same is narrower.

If less than two (2′) feet in depth estimate actual width.

For pits or pier holes more than two (2′) feet deep and less than twelve (12) square feet in area estimate area of same on base of twelve (12) square feet multiplied by depth of same down to five (5′) foot, and if more than five (5′) feet deep estimate on same basis as given below for additional depth of trenches, with the same percentages of increases added.

Add 75% to actual contents of excavation of trenches, pier holes, or pits for depth between five (5′) ft. to ten (10′) ft.

Add 150% to actual contents of excavation of trenches, pier-holes, or pits, for depth between ten (10′) ft. and fifteen (15′) feet.

Add 225% to actual contents of excavation of trenches, pier holes, or pits for depth between fifteen (15′) feet and twenty (20′) feet.

Add 300% to actual contents of excavation of trenches, pier holes, or pits for depth between twenty (20′) feet and twenty-five (25′) feet.

Add 375% to actual contents of excavation of trenches, pier holes, or pits between twenty-five (25′) feet and thirty (30′) feet in depth.

Add 450% to actual contents of excavation of trenches, pier holes, or pits between thirty (30′) feet and thirty-five (35′) feet in depth, and so on, adding 75% accumulative for every five (5′) feet additional depth.

BACK FILLING AND GRADING.

3. Soil required for back filling or grading to be measured by computing from cross-sectioning cubic contents of area to be filled or graded.

SHEET PILING.

4. Sheet piling and lagging to be estimated per thousand feet of lumber required. Kind of lumber to be specified.

SHORING OF EARTH BANKS.

5. Shoring of earth banks to be done at unit price, per square foot of shored surface of bank.

DRAINING.

6. Pumping or bailing when required to be done at special price, in addition to excavation unit price, as the excavation rules are based on dry work; this, however, does not apply to rain or storm water.

CONCRETE FOUNDATIONS.

7. Foundations for walls to be measured actual contents when made with square and level off-sets.

Footings with sloping or beveled off-sets less than 30% from the horizontal multiply area of base by greatest height of footing. This applies to piers also, except when courses in pier foundations are less than twelve (12′) feet in area, when one (1) cubic foot will be added for each corner for every foot in height of such course.

8. Foundations for all projections such as chimney breasts, pilasters, buttresses, or flues connected with walls to be measured actual contents contained therein, and one cubic foot added thereto for each corner for every foot in height.

9. Recesses and slots in foundations to be measured solid and in addition thereto allow two (2) cubic feet for every foot in height or length.

10. Arches in foundation. Multiply length of chord at spring of arch by height from chord to extrados by thickness of arch, and add to the wall measurement. Height of arching equal to thickness of wall.

CIRCULAR OR POLYGON FOUNDATIONS.

11. Circular or polygon foundations to be figured at double actual contents.

EXTERNAL, DIVISION AND INTERIOR CONCRETE WALLS.

12. For walls fourteen (14) feet or less in height, twenty-four (24) inches or more in thickness, use the actual thickness as basis in computing the volume. For walls less than twenty-four (24) inches in thickness, add one-half the difference between the actual thickness and twenty-four (24) inches in computing the volume. If walls

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are more than fourteen (14) feet in height between floors add to cubic contents fifteen (15) per cent for every additional four (4) feet in height, on accumulative scale, as given for trench excavation.

CIRCULAR WALLS.

13. For circular walls of radius sufficiently large to obviate the necessity of using specially prepared lumber for forms, add one-fifth (1-5) of length to girt of wall, and figure cubic contents on the same basis as prescribed for External and Division Walls, Paragraph 12.

BATTERED WALLS.

14. For battered, or sloping walls estimate contents on same basis as for external and division walls, and add one-half (½) of contents of wedge, or batter to same when narrower on top than twenty-four (24") inches. See Paragraphs 12 and 17.

INTERSECTION OF WALLS.

Intersection of division walls twenty-four (24) inches thick or less (bonded together in any manner not abutting) to be measured as slot or recess. When thicker add (1) one foot to length of wall for every intersection when measuring.

RETAINING WALLS.

15. In retaining walls reinforced with beams, columns, or girders figure concrete casing a minimum thickness of twelve (12") inches from outside edge of steel on side next to earth bank and six (6") inches from outside edge of steel on opposite side—i. e. compute wall one foot, six inches (1'-6") thicker than width of steel.

For all other retaining walls compute on same basis as for external or internal walls, paragraphs twelve (12) and seventeen (17.)

No deduction in cubic contents of concrete to be made for metal imbedded in same.

HOLLOW WALLS.

16. Hollow walls to be at special rates.

CORNERS.

17. For each corner of wall more or less than ninety (90) degrees add one foot, six inches (1'-6") to girt length of walls in measuring.

The term corner is used for salient angles of walls, and angle for re-entering angles.

PILASTERS, ETC.

18. All plain projections, such as chimney breasts, piers connected with walls and pilasters to be measured actual contents contained therein, and one (1) cubic foot added for each corner for every foot in height.

PIERS.

19. Independent plain square piers to be measured by the same rule, i. e. add one cubic foot for each corner for every foot in height. For plain polygon or round piers, add four (4) cubic feet for each foot in height.

RECESSES.

20. Recesses and slots to be measured solid and in addition thereto allow two (2) cubic feet for every foot in height or length.

ARCHES.

21. In Vaults: multiply length of chord at spring of arch by height from chord to extrados by thickness of arch.

In walls: find contents of arch by same rule and add same to wall measurement, as called for in paragraph ten (10).

In sewers and tunnel arches: multiply length of extrados by thickness of arch.

OPENINGS WITH FRAMES BUILT IN.

22. Deduct contents of windows, doors and other openings, measuring from jamb to jamb and from top of sill to spring of arch, and add two (2) feet of wall for each jamb for every foot in height of opening when plank frames are used; if box frames are used add four (4) feet of wall for each jamb for every foot in height.

OPENINGS WITHOUT FRAMES.

23. Deduct contents of openings, same to be measured from top of sill to spring of arch and shortest distance between concrete jambs for width, and add for each jamb two (2) feet of wall for every foot in height of opening.

Circular, oval or other special shaped openings to be figured at special price.

CHIMNEY BREASTS, FLUES AND PILASTERS.

24. All flues and hollows in chimneys or walls less than two (2) feet in area, figure solid and add two (2) cubic feet for every foot in height. All flues and hollows in chimneys or walls from two (2) feet to four (4) feet in area to be measured solid. When larger, deduct one-half (½) of contents of flue.

Detached portions of chimneys in buildings and plain chimney tops above roof to be measured solid, and one (1) cubic foot to be added for each corner for every foot in height.

DETACHED STACKS.

25. Detached chimney stacks to be figured at special rates.

TRIMMINGS.

26. No deductions allowed for omissions of concrete for cut-stone, terra cotta or other trimmings, bond blocks, timber, joists or lintels.

All ornamental or moulded work in cornices, gutters, belt or sill courses, etc., to be figured at special rates.

CUTTING AND PATCHING.

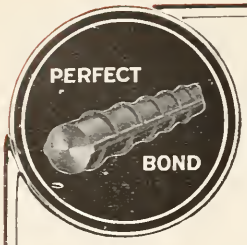
27. Cutting and patching of joists, girders, or other holes, slots, panels, recesses, etc., to be paid for on basis of time and material required.

TOOTHING.

28. When ordered by the Owner, Architect, Engineer, or the Superintendent in charge of the work, to rack or block in consequence of delay of delivery of iron, steel, stone, terra cotta, or other material, that concrete work may connect with such racking or blocking shall be measured as extra work, as follows: Increase girt length of such line by one-half (½) and multiply by thickness of wall.

CONCRETE FLOORS ON SOIL AND TILE ARCHES.

29. Floors to be measured by the superficial surface between outside walls of building. No deduction to be made for floor sleepers, conduits, pipes, drains, division or partition walls. No deduction to be made for any piers, columns, chimney breasts, pilasters or other projections of walls of ten (10') feet or less in area.



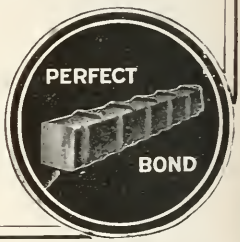
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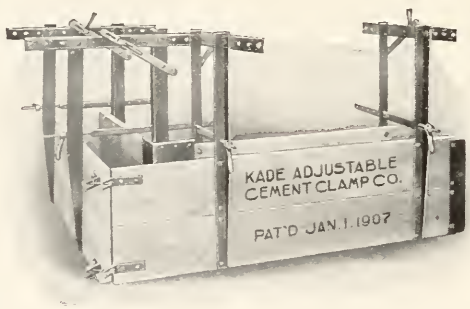


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CAISSONS.

30. Owing to grillage in caissons being left at different heights in same building, unit price for caissons will be computed on excavated contents, including necessary wood-lagging and rings for same. Cubic contents of excavation of caissons to be computed from top of first set of lagging to bottom of caissons and from outside to outside of lagging. If steel or other special casing is required same to be paid for additional, at special unit price per pound.

BELLS.

31. Area of bottom of bell to be multiplied by height of bell to neck for cubic contents.

32. For Caissons 7′ 0″ or more in diameter estimate actual contents from outside to outside of lagging.

For Caissons from seven to six ft. six inches inclusive add 5% to actual contents.

For Caissons under six feet six inches to six feet inclusive, add 15% to actual contents.

For Caissons under six feet to five feet six inches inclusive, add 25% to actual contents.

For Caissons under five feet six inches to five feet inclusive, add 35% to actual contents.

For Caissons under five feet add fifty per cent (50%) to actual contents.

33a. If compressed air is required, same to be paid for in addition to the above.

33. If rings are ordered left in caissons, same to be paid for additional at unit price per pound.

34. Pumping and bulkheading to be paid for at additional price.

35. No deduction to be made for cubic contents of metal imbedded in concrete.

CONCRETE FILLING IN CAISSONS.

36. Concrete for filling of caissons to be computed on actual contents per cubic foot of concrete, but no deduction to be made for any metal imbedded in same.

REINFORCED CONCRETE WORK.

37. Reinforced Walls:

Compute concrete on same basis as specified in Sections 12 and 17, for external and division walls, and add to same cost of reinforcing metal put in place. If through changes or revisions cutting of reinforcing metal delivered or ordered becomes necessary, estimate the full length of such bars or metal fabric, and add to same cost of cutting and fitting required. Reinforcing metal to be computed on unit price per pound or square foot. No deductions to be made in estimating cubic contents of concrete for any metal imbedded in same, such as wire netting, expanded metal, bars, beams, columns, etc.

COLUMNS.

38. Measuring of plain uniform size columns to be covered by the foregoing paragraph 19 relating to piers.

39. Capitals, caps, brackets, panels, mouldings or other ornamental or moulded work to be figured special rate.

GIRDERS, FLOOR BEAMS OR OTHER DROP PROJECTIONS BELOW FLOOR SLAB.

40. For projections named in this paragraph add for each corner and angle to cubic contents one (1) cubic foot for each foot in length. For each chamfered or rounded corner or angle add one-half (½) cubic foot for each foot in length in addition to the above.

FLOOR SLABS.

41. Floor and roof slabs to be estimated on same basis as called for in paragraph 29 for floors on soil, and at a minimum thickness of six (6) inches. Less than six (6) inches in thickness will be computed as six (6) inches.

OPENINGS.

42. No deductions to be made in floor area for openings of less than twenty (20) square feet. For larger openings after deducting full area of opening, add one (1) superficial foot to floor area for each foot in length of girt of opening, and one (1) CUBIC FOOT extra for each corner or angle.

DEPRESSIONS.

43. For pits, baskets or other depressions in floor, add one superficial foot to the area of walls and floors of same for each foot in length of each corner and angle.

SETTING OF FACIAS, FRAMES, PIPES, SLEEVES, BOLTS, RODS, CLAMPS, ETC.

44. Setting of facias, frames, pipes, sleeves, bolts, rods, clamps, etc., imbedded in concrete to be paid for additional at special price.

FLOOR BASE AND COVES.

45. Floor base and coves to be estimated at special price per lineal ft. with one foot added to length of same for each corner and angle. For base or cove around round columns estimate three (3) times girt of column and for square or polygon columns add one foot for each corner to girt of same.

46. Concrete stairs to be estimated square foot area of face of treads and risers. Stair-landings and platforms between floors to be same unit price per foot as stairs.

47. Curbs and roofs or skylights to be estimated on same basis as called for in sections 40 and 41 except that quantities for same shall be doubled.

48. Sidewalks laid on soil or tile and brick arches, to be estimated as floor-slab section 29 with special unit price.

Sidewalks reinforced to be estimated same as called for in sections 40 and 41 with special unit price.

Curbs to be estimated per lineal foot at special unit price.

Driveways to be estimated square foot area at special unit price.

(Signed)

H. B. Wheelock.
Thomas H. Mullay,
Joseph C. Lewellyn,
L. G. Hallberg,
Arthur Woltersdorf,
Joachim G. Giaver,
Louis E. Ritter
Alexander C. Warren,
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THE ECONOMICS OF CONCRETE

Extracts from a Paper Read Before the Architects' Business Association of Chicago
By Arthur B. Hewson.

November 23, 1909

I propose to prove that any given quantities of gravel, sand and cement mixed in the generally used proportions such as 1:2:4 and 1:3:6 will make at least 7½% more concrete than like quantities of crushed limestone, sand and cement.

I propose to prove, as a matter of sequence, that **on an even basis of price** for gravel and crushed stone, gravel concrete costs in place at least 32 cents per cubic yard less than limestone concrete on carload delivery of materials, and at least 39 cents per cubic yard less on team delivery. Incidentally, I call your attention to the fact that the price of gravel averages 10 cents per cubic yard less than limestone.

The explanation of the greater bulk of gravel concrete is that gravel, on account of the rounded shape of its particles, averages 7½% less in voids than crushed stone. When you mix concrete 1:2:4 or 1:2½:5 or 1:3:6 you have 50% of sand to fill the voids in the coarse aggregate. If the voids in crushed stone absorb 95% of the sand and the voids in gravel only 80%, it naturally follows that 15% more of the sand appears in the gravel concrete, thereby increasing its bulk 7½%.

Practically all authorities agree that the voids in the average washed gravel are 40%, and in the average crushed stone 47.4%. I refer you to "Thompson & Taylor on Concrete." That this is true of Chicago's gravel and limestone is proven by a comparison of the standards used by the trade in reducing the weighed materials to the selling unit of the cubic yard:

Limestone	2,500 lbs. per cu. yd.
Gravel	3,000 lbs. per cu. yd.

Assuming the standard for limestone to be correct, and that of gravel unknown, other things being equal, we have the following proportion, the weights of the two materials being in inverse proportion to their voids:

$$x : 2500 :: 47.4 : 40$$

This produces gravel at 2960 lbs. Adding the 40 lbs. difference to cover the greater density of the gravel due to the presence of a large proportion of granite, trap and other igneous rocks heavier than limestone, we demonstrate conclusively the relative voids to be substantially as stated.

This is working out in self-explanatory figures what I have established by actual experiment and am prepared to prove at any time to anybody.

I have stated that at an even price on a basis of economics, crushed stone for concrete is worth 32 to 39 cents per cubic yard less than gravel.

Let me demonstrate it:

CARLOAD DELIVERY.

Limestone Concrete—1:2:4.

Stone, 100 cu. yds., @ $1.00		$100.00
Sand, 50 cu. yds., @ $1.00		50.00
Cement, 175 bbls., @ 85 cents		148.75
	* 108.5	$298.75
		2.75⅛

*Number of cubic yards of concrete 1:2:4 produced by above quantities, according to "Thompson & Taylor," voids 47½%, 108.5.

Gravel Concrete—1:2:4.

Gravel, 100 cu. yds., @ $1.00		$100.00
Sand, 50 cu. yds., @ $1.00		50.00
Cement, 175 bbls., @ 85 cents		148.75
108.5 + 7½% = 116.64		$298.75
		2.56

Limestone concrete cost	2.75½ per cu. yd.
Gravel concrete cost	2.56 " "
Savings on materials	0.19⅛ per cu. yd.
7% cost of handling and mixing, figured at $1.85 per cu. yd.	0.12 9-10 per cu. yd.
Total saving	0.32 7-30 per cu. yd.

TEAM DELIVERY.

Limestone Concrete—1:2:4.

Stone, 100 cu. yds. @ $1.50		$150.00
Sand, 50 cu. yds. @ $1.50		75.00
Cement, 175 bbls. @ $1.00		175.00
	108.5	$400.00
		3.68⅔

Gravel Concrete—1:2:4.

Gravel, 100 cu. yds., @ $1.50		$1.50
Sand, 50 cu. yds., @ $1.50		75.00
Cement, 175 bbls., @ $1.00		175.00
	116.64	$400.00
		3.42 9-10

Limestone concrete cost	$3.68 2-3 per cu. yd.
Gravel concrete cost	3.42 9-10 per cu. yd.
Saving on materials	$0.26 11-30 per cu. yd.
7% cost of handling and mixing, figured at $1.85 per cubic yard	$0.12 9-10 per cu. yd.
Total saving	$0.39 8-30 per cu. yd.

* * *

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There is another point of importance in the economics of concrete.

It is agreed that the strongest concrete is that in which there is just sufficient sand to fill the voids in the coarse aggregate plus a small percentage to cover inequality in mixing, with the same conditions obtaining between the sand and cement.

When you add more sand than this, you weaken your concrete because the sand contains more voids than the coarse aggregate.

Does it not follow that, if gravel concrete excels limestone when compared in identical proportions, it would still further excel in comparison where the sand is in the same proportion to the voids in both materials? For illustration, would not 1½:3:7 gravel concrete excel a 1:2:4 limestone concrete? Would it not be proportionately rich in cement? Would it not give an equal bulk of concrete and a greater strength efficiency with less sand and less cement?

Furthermore, if a 1:2:4 limestone mixture produces a smooth finish, will not 1½:3:7 gravel concrete do the same since the proportion of mortar to the voids is identical in both cases?

In view of the fact that the consistency in which concrete is mixed is a large factor in its strength,would it not be well to regulate the quantity of water used as carefully as you do the other elements? It will give your walls and floors uniformity of strength. It will make your stress figures more dependable, and your factor of safety less wasteful.

In confined spaces where the intervals between the reinforcing bars are small or the concrete must be forced through wire mesh, a denser and therefore stronger concrete can be obtained with gravel. The rounded particles work into place more readily and lie snug to the steel. There are few jagged edges to catch on and the steel or on companion particles forming pockets which reduce the strength and damage the appearane of the surface.

Gravel concrete, properly proportioned, will produce water tight walls, where limestone will fail under the same conditions. This is also due to the lesser proportion of voids and the closer association of the particles.

With regard to the fire resistance of gravel concrete, Bulletin No. 370, U. S. Geological Survey, shows its superiority over limestone. The limestone is badly damaged by calcination. This bulletin, also shows that fire-proofing tile, sand-lime, brick, and practically every other material except solid concrete are useless, for fireproofing.

The statements I have made as to the relative quantities of concrete produced by crushed stone and gravel and their relative strengths, I am prepared to prove and I take the liberty of suggesting that you appoint a committee to confer with me with a view to arranging a series of tests by competent authorities concerning these points. I have, no doubt, in fact, I am positive, that, if you should so desire, arrangements could easily be made with the local gravel companies to prove at their own expense such statements as I have made, and other valuable facts might be developed through such an investigation. * * *

SPECIFICATIONS FOR STANDARD HOLLOW TILE FIREPROOFING.

GENERAL.—The contractor for this work will be required to furnish all the material and labor of every description required to erect the same in place complete. The contractor is referred to the plans and details for the general construction, and especially the steel diagrams and details showing connection between the structural steel and tile work.

SPECIAL SHAPES.—The contractor shall furnish all necessary special shapes for the proper fitting to the steel work.

DETAILS.—When requested to do so the contractor shall furnish large scale details or full sized drawings for all special shapes, column coverings, lintel covers, girder covers, and general type of arch, which shall be submitted to the architects for their approval.

SCAFFOLDING, TOOLS, ETC.—Furnish all the tools, machinery, hoisting apparatus and centering necessary to carry on the work at the rate of progress stipulated in the contract.

TILE.—All the tile required for this work shall be of the best quality of hard burned fire clay, semi-porous, or porous terra cotta. This tile to be well manufactured, no badly split, cracked or warped tile will be permitted to go into the work.

MORTAR AND LAYING.—All tile work for the floor construction shall be laid in mortar composed of one (1) part American Portland Cement, of approved brand, four (4) parts sharp sand and one part (1) lime mortar, all thoroughly well mixed together as follows: The sand and cement are to be mixed together dry and sufficient water added to thoroughly wet the same, after which the lime mortar is to be added and the whole mass is then to be thoroughly tempered. All other tile work is to be laid in mortar composed as follows: One (1) part Louisville, Rosendale, or other natural cement, three (3) parts sharp sand and one part lime mortar, thoroughly mixed in the manner before described. All tile must be laid with full flush joints, plumb, to a line, with horizontal beds uniformly level on each course. Fill all the joints, chinks and crevices between the tile and steel work with mortar well slushed in.

TYPE OF ARCH.—The arches for the floors in general shall be ——— inch; flat or segment arches, with side or end construction. Skewbacks carefully bedded in place against beams.

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BEAM TILE.—The soffits of all beams to be protected with slabs of tile at least 1 inch in thickness. If more than one inch, the beam tile must be made with air space next to beam.

ROOFS.—The arches for the main roof are to be ———— in segment or flat arches same as specified for the floors.

MINOR ROOFS.—The roofs of pent houses, roof over projecting portion in second story, floor of bulkheads, and other portions indicated on details as book-tile shall be made of three-inch (3 in.) book-tile set in place between tee-irons. Tee-irons to be furnished by the iron contractor.

PARTITIONS.—All partitions shown on the plans to be built the thickness indicated in figures. If no dimensions are given, the following sizes will govern:

Partitions for all corridors and for partitions over 12 feet and up to 14 feet in height to be 4 inches. Partitions over 14 feet in height to be 6 inches, and all cross partitions 12 feet or less to be 3 inches. Partition walls to be built straight, true, plumb and well bonded with proper "breakjoint" bond on each alternate course, and all joints thoroughly flushed up with mortar, and to be well wedged underneath.

FURRING TILE.—Where indicated on plans, 2 inch furring tile are to be built against the outside walls of the building. These tiles are to be secured to the brick walls with 10d spikes on every third course, driven into the brickwork at intervals not greater than 48 inches apart.

CURB WALL.—The curb wall in basement shall be furred with three-inch (3 in.) tile extending up to the under side of the iron plate along edge of curb wall and properly fitting around all beams.

ROUGH FRAMES AND BLOCKS.—The contractor for carpenter work will furnish and erect the rough wood frames at all openings in partitions and furring. He will also furnish all wooden blocks necessary to form nailing facilities for attaching plaster grounds, etc. These blocks must be built in place by fireproofing contractor wherever directed by the architect.

COLUMN COVERING.—All column covering shall start, in all cases, directly from the tile arches of floor. Column covering shall be designed to properly fit the columns.

All corners of square columns shall be left square or round. Column covering to be wired on once or twice in each course in height or secured together with clamps.

COVERING EXPOSED STEEL WORK.—All girders, beams, channels, etc., that show below the under side of ceilings are to be encased on all sides with at least 1-inch thickness of fire-proof tile secured to the steel in the usual manner. If required, special designs must be submitted to the architect.

BOXES FOR PLUMBING PIPES.—All soil, vent, down spout and water supply pipes shall be boxed in, using three-inch (3 in.) tile, starting from the floor tile in all cases. This boxing shall not be done until the pipes have been properly tested, and covered by another contractor. There shall be no openings into boxes except for outlets on the various floors. Where these outlets occur small wood frames furnished by carpenter shall be set by the fireproofing contractor.

BULKHEADS.—All bulkheads of first and second floor shall be built of 3-inch tile; the structural iron contractor furnishing all necessary tee-irons for the support of the tile. See details for bulkhead treatment, and iron drawings for the supports.

Provide three-inch (3 in.) tile for the ends of bulkheads where intersected by the entrance doors.

TOILET ROOM FLOORS.—All toilet room floors where shown on plans shall be raised approximately one foot with fireproofing. Supports to be so arranged as not to interfere with the piping of these rooms.

PENT HOUSES.—The contractor shall build the walls of pent houses with four-inch (4 in.) hard or glazed tile, laid up in Portland cement mortar, all joints to be thoroughly flushed up.

Curbs of all skylights shall be built of four-inch tile.

FLOOR STRIPS AND CONCRETE FILLING.—After the floor arches have been set in place, and at such times as may be designated by the architect, the contractor for carpenter's work will furnish and set the 2x3-inch wood floor strips required as nailing ground for the finished wood flooring, where wooden flooring is called for.

After the strips have been set, the fireproofing contractor must fill in between the same with concrete filling; this concrete is to be composed of one (1) part American Portland Cement, of approved brand, two (2) parts sharp sand, and six parts broken tile, stone, gravel or fine, clean coal cinders, thoroughly mixed together dry, then tempered and mixed, and tamped in place. In no case shall cinder concrete be allowed to come in contact with structural steel.

FINALLY.—Do everything necessary to finish the entire work in a thorough and substantial manner. Remove promptly from the premises all the tools, scaffolding, unused tile, debris, etc., as soon as the work is completed.

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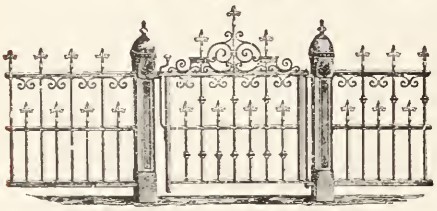
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BASE AND BEARING PLATES FOR COLUMNS AND BEAMS.

A. Plain Plates Without Ribs.

By N. Clifford Ricker, D. Arch., Professor of Architecture.
Abstract from a Bulletin to be published by the Engineering Experiment Station of the University of Illinois.

1. EXPLANATIONS—Since both experiments and theory have proved that cast iron base plates break along a diameter, and not along a line tangent to the lower end of the column, it became necessary to deduce a new series of formulas and to devise simple methods and tables for applying these formulas in practice. The formulas previously given are safe under ordinary conditions, but those here given will be found applicable in all cases, and more easily and rapidly. They may also be employed to fulfill the requirements of any building ordinance.

2. LIMIT OF SAFE PRESSURE OF PLATE ON MASONRY—This varies greatly with the material and according to the ordinances of the different cities, varying between 70 and 1000 lbs. per sq. inch. The proper value must be taken as prescribed by the local building law. The maximum safe pressures permitted in Chicago are as follows, in lbs. per sq. inch:

Portland cement concrete	173.61
Dressed dimension stone	173.61
Rough dimension stone	138.89
Brickwork in Portland cement	173.61
Brickwork in ordinary cement	125.00
Brickwork in lime mortar	90.28

3. MAXIMUM SAFE FIBRE STRESS IN PLATE—The following values for fibre stresses in lbs. per sq. inch are generally adopted:

Steel, 16,000 for tension or compression.

Wrought iron, 12,000 for tension or compression.

Cast iron, 2,500 or 3,000 for tension.

Cast iron, 10,000 or 16,000 for compression.

Experiments on plates prove that 3,000 is safe for tension in cast iron, if the plates are properly inspected.

4. NOTATION EMPLOYED IN FORMULAS—The fracture line is here assumed to be the shortest diameter of the plate, and the moments of the upward and downward pressures acting on one-half the plate are taken about this fracture line or diameter.

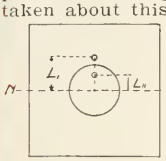


Fig. 1

Let A = bottom area of plate in sq. inches.

B = length in inches of fracture line.

c = vertical distance in inches from horizontal neutral axis of fracture section to bottom of plate.

f = maximum safe tensile fibre stress in lbs. per sq. inch acting in metal of plate at fracture section.

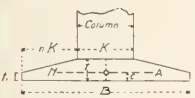


Fig. 2.

K = length in inches of horizontal top of fracture section beneath end of column or of beam.

nK = projection in inches of fracture section outside end of column or beam.

I = moment of inertia of vertical fracture section of plate.

$\frac{I}{c}$ = modulus of resistance of fracture section.

L′ = lever arm in inches of moment about fracture line, for the upward pressure of masonry on one-half area of plate.

L″ = lever arm in inches of moment about fracture line, for the downward pressure of column or beam end on one-half area of plate.

M = resultant bending moment in inch-lbs. about fracture line, for one-half area of plate.

R = maximum safe resisting moment in inch-lbs. for fracture section of plate.

p = maximum safe pressure of plate on masonry in lbs. per sq. inch. For values, see Art. 2.

P = A p = total weight in lbs. of plate and its load. Since the weight of plate is very small in comparison with its load, it may usually be omitted without serious error.

t = thickness in inches of plate beneath end of column or beam.

t′ = thickness in inches at edge of tapered plate.

5. GENERAL FORMULAS—$M = \frac{P}{2}(L' - L'')$ is the general formula, which is applicable in all cases.

$R = \frac{f B t^2}{6}$ applies to plates of uniform thickness. Equating and reducing these formulas, we obtain the following general formula for plates of uniform thickness only:

$$t = \sqrt{\frac{3P}{B}(L' - L'')}.$$

This formula can also be used for obtaining the thickness of a wall or bearing plate, which is tapered in thickness toward each end.

The formulas for the thickness of tapered cast iron plates under columns are very complicated in form and tedious in application, so that they are here omitted. But a method of obtaining the thickness in this case is given in Art. 7.

6. FORMULAS FOR VALUES L′ AND L″.

$L' = \frac{\text{length in ins.}}{4}$, for wall or bearing plate.

$L' = \frac{\text{side in ins}}{4}$, for square plate.

$L' = \frac{\text{inscribed diameter in ins.}}{4.58}$, for octagonal plate.

$L' = \frac{\text{diameter in ins.}}{4.74}$, for round plate.

$L'' = \frac{\text{width of beam in ins.}}{4}$, for wall or bearing plate.

$L'' = \frac{\text{side in ins.}}{4}$, for solid square post.

$L'' = \frac{\text{inscribed diameter in ins.}}{4.58}$, for solid octagonal post.

$L'' = \frac{\text{diameter in ins.}}{4.74}$, for solid cylindrical post.

$L'' = .500\,\frac{R^3 - r^3}{R^2 - r^2}$, for hollow square column.

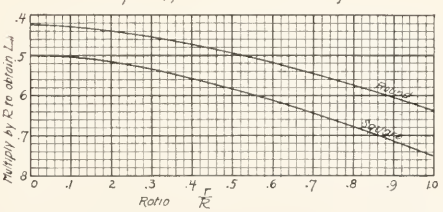
$L'' = .424\,\frac{R^3 - r^3}{R^2 - r^2}$, for hollow round column.

In the last two formulas only:

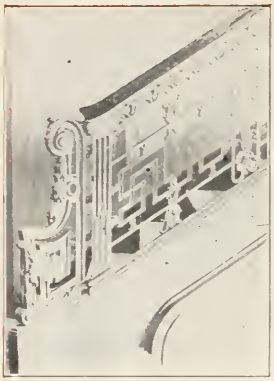
R = external half side in ins. of square column or radius of round column.

r = internal half side in ins. of square column or radius of round column.

Table for L_n for Column Section. Fig 3.



The required values of L″ for hollow columns may be easily obtained by the aid of the table in Fig. 3.



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Example.—Required L" for column 12 in. square and with 1½ in. metal. Then $\frac{r}{R} = \frac{4.5}{6.0} = 0.67$. Taking vertical through 0.67 in Fig. 3, ist intersection with the line for square column gives 0.635 at left side by a horizontal. Then $L'' = 0.635 \times 6.00 = 3.81$ ins.

7. GRAPHICAL TABLES.

Calculations for base plates may be almost entirely avoided by using the following graphical tables:

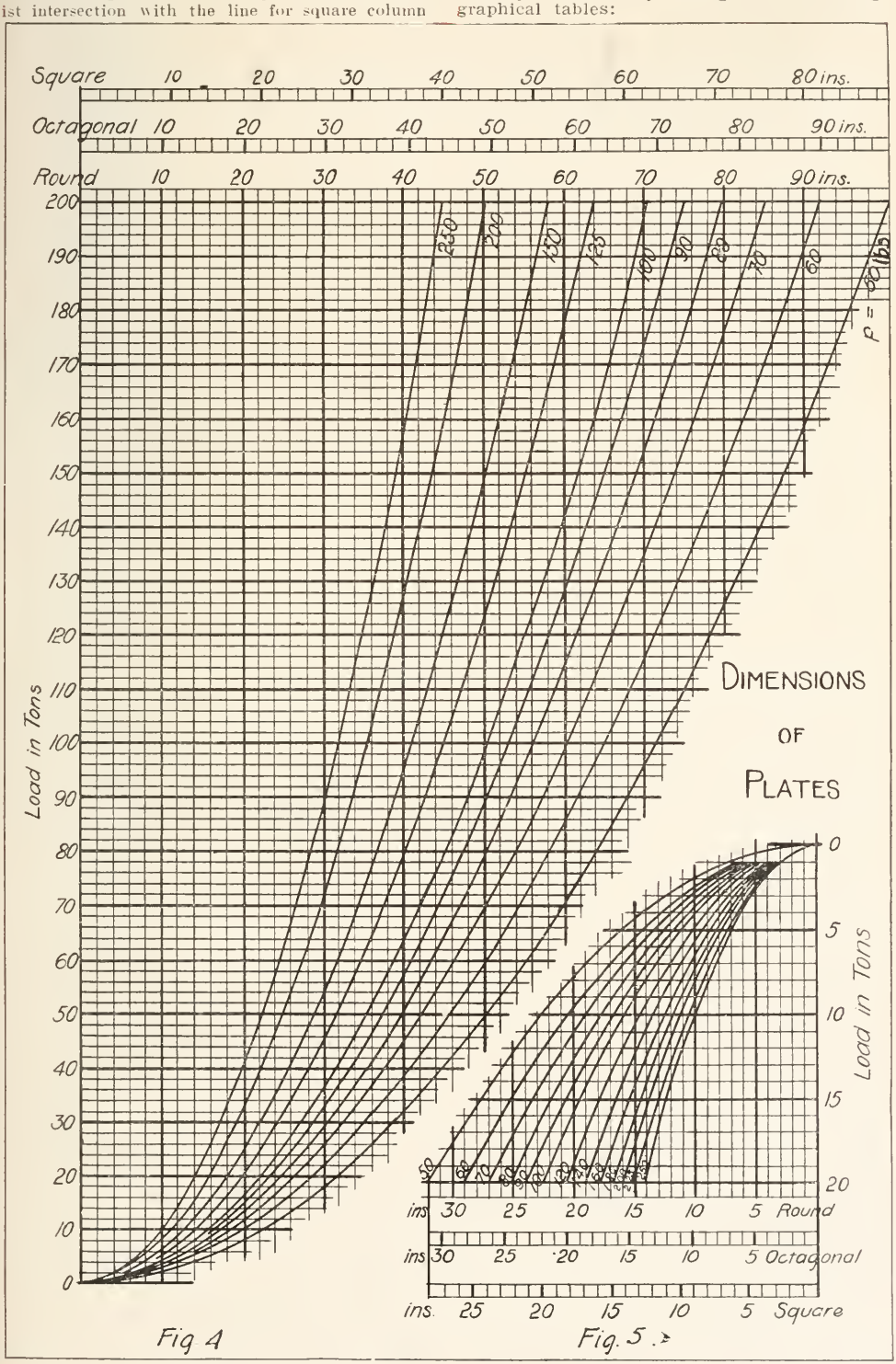


Fig 4 Fig. 5.

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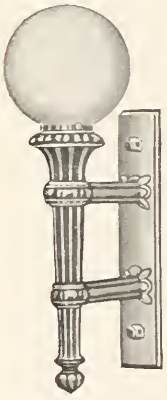
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Figs. 4 and 5 give directly the side of a square, the inscribed diameter of an octagonal, or the diameter of a round plate, for loads not exceeding 200 tons.

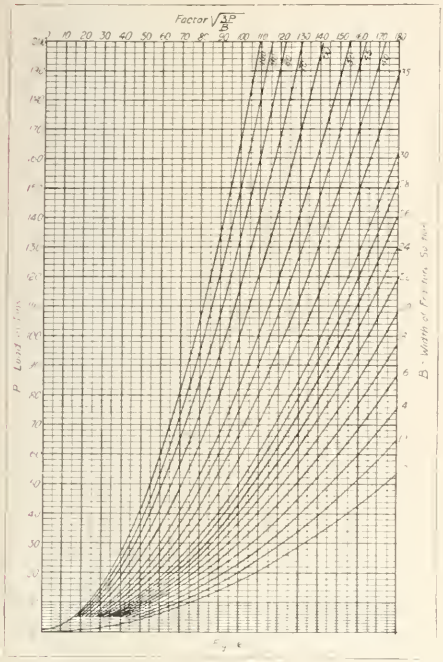


Fig. 6 gives the numerical value of the factor $\sqrt{\frac{3P}{B}}$ for plates with fracture lines not exceeding 100 inches in length, and with loads not over 200 tons.

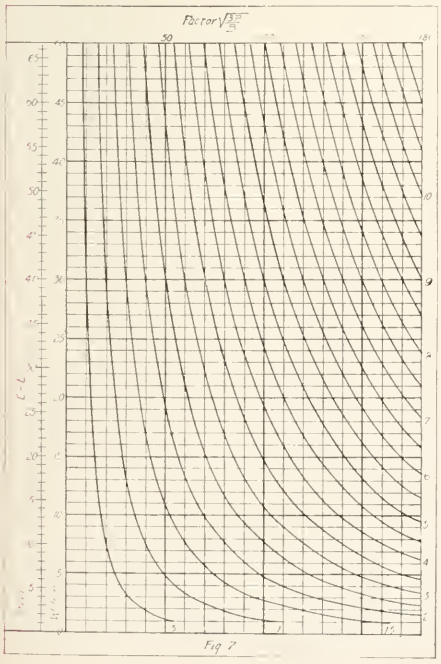


Fig. 7 then determines the required thickness of a steel or wrought iron plate of uniform thickness.

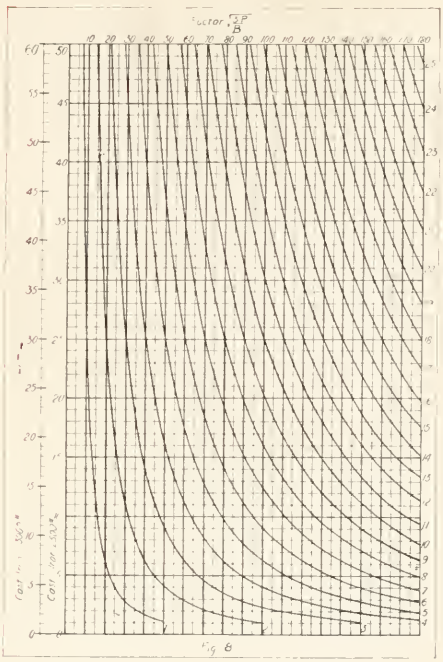


Fig. 8 gives the required thickness of a cast iron plate of uniform thickness for safe stresses of 2500 or 3000 lbs. per sq. inch.

Example 1.—Required thickness of square steel plate transmitting 90 tons to masonry allowed to safely carry 125 lbs. per sq. inch. Column 9 ins. diameter, metal 1⅛ ins. thick.

In Fig. 4 a horizontal through 90 tons intersects curve for 125 lbs. on a vertical through 39.0 ins. on the line marked "square" at top of Fig. 4, the required side of the square plate. Then a horizontal in Fig. 6 through 90 tons intersects curve for 39 ins. on a vertical through 118 at top, the value of the factor $\sqrt{\frac{3P}{B}}$. By Art. 6, $L' = 9.75$. By Fig. 3 in Art. 6, $L'' = 2.53$. Hence $L' - L'' = 9.75 - 2.53 = 7.23$ ins. In Fig. 7, a horizontal through 7.23 on line for steel at left side intersects vertical through 118 at top of plate on the curve for 2.5 ins., the required thickness of the steel plate.

Example 2.—Required, the thickness of a square cast iron plate under the same conditions. Safe fibre stress 2500 lbs., the edge thickness to be one-fourth its thickness beneath the column.

In Fig. 8, a horizontal through line for 2500 lbs. at the left intersects a vertical through

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118 at top on a curve corresponding to 6⅜ ins. = t = uniform thickness of plate. But $\frac{t'}{t}$ = 0.25. $n = \frac{39-9}{2\times 9} = 1.67$.

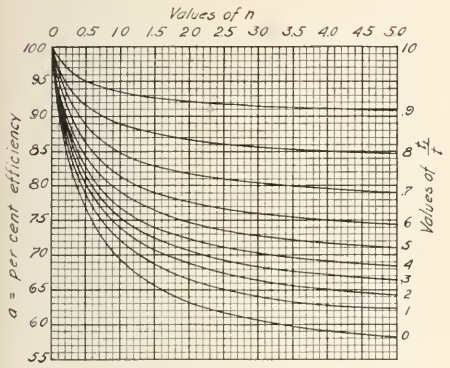


Fig 9.

In Fig. 9, a vertical through 1.67 at top intersects curve for 0.25 on a horizontal through 71 per cent at left side. This means that such a tapered plate would have 71 per cent of the resistance of a plate of uniform thickness, t.

Let a = this per cent found by Fig. 9.

Then $t \times \sqrt{\frac{100}{a}}$ = required increased thickness beneath the column possessing the required strength.

And $6.375 \times \sqrt{\frac{100}{71}} = 7.57$ ins. = required thickness beneath the column. Also $\frac{7.57}{4} = 1.89$, say 1⅞ ins. thick at edge and 7⅝ ins. at centre of plate.

B Plates with Vertical Ribs.

By C. E. Noerenberg, Arch. Eng.
(Research Fellow in Architecture.)

Abstract of a Bulletin to be issued by the Engineering Experiment Station of the University of Illinois.

Exact information concerning this detail of construction is very limited in amount, and therefore such plates are generally designed by mere "rules of thumb." The writer has made the only known series of tests on actual plates, and from the results are deduced the following conclusions and formulas:

The first series of tests was made on thirty plates, comprising the types of square, octagonal and round plates, with four or eight ribs each variously arranged. They were designed in accordance with Clausen's theory, as stated in the Handbook for 1908. They were cast in a local foundry, then tested to destruction on an elastic cushion reproducing practical conditions as closely as possible. But the fact that the ultimate strengths of the plates were not uniform, varying from 566,000 pounds to 330,000 pounds, that the actual modulus of rupture per sq. in. varied from 69,500 pounds (an impossible value for cast iron) to 41,560 pounds, and that the plates did not break in the manner assumed, proved the theory defective. Hence the following theory and formulas were employed in designing a second series of plates.

According to all the former tests, the plate breaks through its centre on a line, which is the least diameter of the plate, that one possessing the least resistance to bending. For the plate acts as an inverted double cantilever beam, loaded by the reaction of the foundation—equal to the load on the plate—and supported at its centre by the column. Observations proved that for the ribbed plate, even under the ultimate load, the outer edges of the plate deflect very slightly, and therefore that the pressure is fairly uniform over the entire surface. Then, since this least diameter defines the weakest part of the plate, the strength of this "fracture section" determines the actual strength of the plate. The uniform pressure on the bottom of the plate per sq. in. of area exerts a bending moment, which must be resisted by the resistance moment of the fracture section.

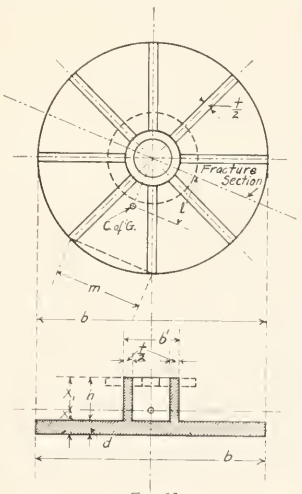


Fig. 10.

Assume a circular plate, for example, as in Fig. 10, with a central hollow cylindrical hub and eight equidistant ribs. The horizontal projecting parts of the top flange, to which the column is bolted, are omitted in the theoretical design, since such parts have such varied dimensions and small actual strength, and since their omission is on the safe side. The metal of the hub is usually placed directly beneath the metal in the column section, and the metal areas in both are equal. The thickness of the metal in the hub and ribs, for practical reasons and for economy of design, as determined by the writer in an extended investigation, should be taken at one-half the thickness of the bottom plate. Then the height and thickness of hub and ribs, and the

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thickness of bottom plate, are the only elements affecting the strength of the plate, the horizontal section and diameter of the hub being immaterial.

Let A = bottom area of plate in sq. ins. = area necessary to support the column and load.

P = total load on the plate in lbs.

p = maximum safe pressure of plate on masonry in lbs. per sq. inch.

l = lever arm in ins. of moment about fracture line = distance from centre of gravity of one-half the area of plate from the fracture diameter of plate.

m = greatest distance in ins. between centre lines of two adjacent ribs.

M = bending moment in inch-lbs. about fracture line for one-half the area of plate.

t = thickness in inches of metal in hub and ribs.

S = safe tensile fibre stress in lbs. per sq. inch for metal of plate.

Let the plate have the dimensions shown in Fig. 10.

Then evidently $A = \frac{P}{p}$.

The bottom plate between the ribs acts as a beam fixed at its ends, and the required thickness at the outer edge of the plate depends on the greatest distance between centres of two adjacent ribs.

Or $d = m \sqrt{\frac{p}{2S}}$.

If t be made equal to d as already explained, the only other required dimension is the height of the plate, and this is determined by means of the breaking moment,

$M = \frac{A\,p\,l}{2}$

This must equal the resisting moment of the fracture section, or = R, hence:—

$M = R = \frac{S\,I}{c}$

Therefore $\frac{I}{c} = \frac{A\,p\,l}{2\,S}$

The required value of $\frac{I}{c}$ for this T-shaped section is obtained by the usual formula.

$$\frac{I}{c} = \frac{t\,x'^3 + b\,x^3 - (b-t)\,(x-d)^3}{3\,x}$$

Wherein $x' = \frac{(h+d)^2\,t + (b-t)\,d^2}{2\,(b\,d + h\,t)}$

And $x = (h + d) - x'$

The first set of plates tested were designed in accordance with this theory, and their modulus of rupture was found to be very uniform for all the types of plates and of nearly the same value for both plates with four and with eight ribs, the average of all being 25,820 lbs. per sq. inch.

A second series of twenty-seven plates of different sizes and of a little better grade of cast iron were tested in the same manner, and the modulus of rupture of the plates with eight ribs was 38,500 lbs. per sq. inch, very little different from that of the plates with four ribs, which was 38,100 lbs. per sq. inch. Four standard test pieces were cast at the same time and fixed the ultimate resistance of the metal to rupture at 41,335 lbs. per sq. inch, thus proving the correctness of the theory with remarkable accuracy.

The tests prove that the square plate is most variable in strength, and that the circular plate is most consistent and that it is to be preferred to the other types. The plate with eight ribs is far more economical than that with four ribs in the weight of metal required.

For the best economy and proportions, the thickness of metal in the hub and ribs should be one-half the thickness of the bottom plate.

For the value of 173.6 lbs. per sq. inch as the safe maximum pressure of the plate on its foundation, and for 2500 lbs. per sq. inch as the safe maximum fibre stress in the metal (cast iron), as required by the Chicago ordinance, the preceding formulas reduce to the simpler forms:—

$A = \frac{P}{173.6}$

$d = 0.1863$ m.

$\frac{I}{c} = \frac{P\,l}{5000}$

And when t = d:—

$$\frac{I}{c} = \frac{d\,x'^3 + b\,x^3 - (b-d)\,(x-d)^3}{3\,x}$$

Here:—

$x' = (h + d) - x$

$x = \frac{(h+d)^2 + (b-d)\,d}{2\,(b+h)}$

To obtain the value of h, select one value and determine the corresponding value of $\frac{I}{c}$. If it equals or slightly exceeds $\frac{P\,l}{5000}$, this value of h may safely be used. If too small, another trial is to be made.

In order to present some values for guidance and comparison, the following table of dimensions for circular plates with eight ribs, as shown in Fig. 10, is here included for various loads:

Table for Circular Base Plates with 8 Ribs.

Safe Load P. lbs.	Area A. sq. ins.	Diam b. ins.	Thickness d. ins.	Hgt. h. ins
20,000	115	12.1	0.86	2.63
35,000	201	16.0	1.14	3.18
50,000	288	19.1	1.37	4.16
75,000	432	23.5	1.67	5.09
100,000	576	27.1	1.93	5.88
125,000	720	30.3	2.16	6.57
150,000	864	33.2	2.37	7.20
175,000	1008	35.8	2.55	7.77
200,000	1152	38.3	2.73	8.31
225,000	1296	40.6	2.90	8.81
250,000	1440	42.8	3.05	9.21
300,000	1728	46.9	3.34	10.17
350,000	2016	50.7	3.61	11.00
400,000	2304	54.2	3.86	11.71
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The **ultimate strength** of a material under tension, compression, or shear, is the greatest unit-stress to which it can be subjected. This occurs at or shortly before rupture, and its value is very different for different materials; thus if a bar whose cross-section is A breaks under a tensile stress, P, the ultimate tensile strength of the material is $P \div A$.

When a small stress is applied to a body a small deformation is produced, and on the removal of the stress the body springs back to its original form. For small stress material, then may be regarded as perfectly elastic.

Under smaller stresses the deformations are approximately proportional to the forces, or stresses, which produce them, and also approximately proportional to the length of the bar or body.

When the stress is great enough a deformation is produced which is partly permanent, that is, the body does not spring back entirely to its original form on removal of the stress. This permanent part is termed a set. In such cases the deformations are not proportional to the stresses.

When the stress is greater still the deformation rapidly increases and the body finally ruptures.

A sudden stress, or shock, is more injurious than a steady stress or than a stress gradually applied.

The **elastic limit** is that unit-stress at which the permanent set is first visible and within which the stress is directly proportional to the deformation. For stresses less than the elastic limit bodies are perfectly elastic, resuming their original form on removal of the stress.

The **working strength** of a material is that unit-stress to which it is, or is to be, subjected. For safety, this must not be greater than the elastic limit of the material used. It should be considerably less to allow for possible defects, usually taken at from one-third to two-thirds the average elastic limit.

Factor of safety for a body under stress or for a piece to be designed is the ratio of the ultimate strength to the working, or the proper allowable working, strength.

Fundamental principles of engineering design are stability and economy: First, the structure must safely withstand all the stresses which are to be applied to it; second, the structure must be built and maintained at the lowest possible cost.

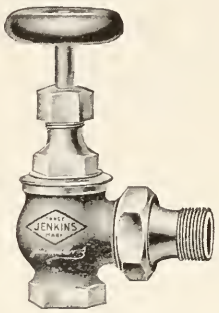
The second of these fundamental principles requires that all parts of the structure should be of equal strength in proportion to the loads which they are required to carry.

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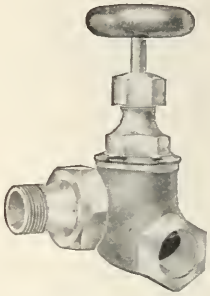
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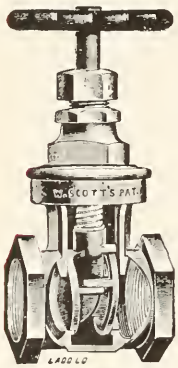


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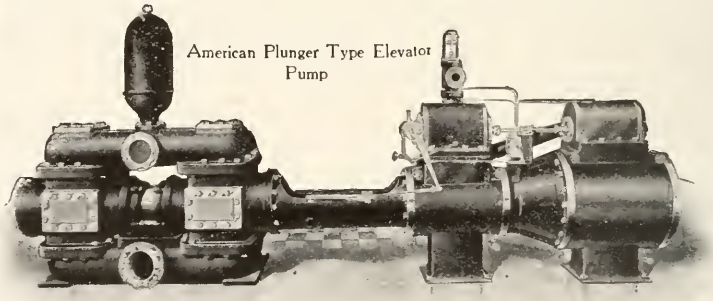
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HEATING.

Steam heating may be classified under a number of different heads, although the two prominent systems are the gravity and vacuum systems. These may be subdivided into up-feed, down-feed, double pipe, single pipe, indirect, direct, etc.

The gravity system is the one in which the condensation falls by its own weight and returns either to the boiler, hot well or receiver, through either a wet or dry return. Where it is possible a system should be so installed that it could operate as a gravity system, even though a vacuum system is contemplated in connection with it.

In the vacuum systems the condensation is usually pumped back by means of a vacuum pump and some form of thermostatic valve. Where a building is heated by exhaust steam from an engine it is sometimes advisable to install vacuum systems, but where such a system is installed the contractor should guarantee to operate the system without any back pressure whatever on the engine. This guarantee should be so drawn that in case he could not produce these results with his apparatus, he would allow his apparatus to remain in service at the option of the purchaser, without any cost whatever to the purchaser. Where a vacuum system is installed no radiator air valve is necessary, other than those supplied by the vacuum company. All systems which are operated without vacuum should have an air valve placed on each radiator. It is not absolutely necessary, but is very desirable to have these air valves automatic. There are a number of automatic air valves on the market which are simple, effective and inexpensive.

It is very essential that all radiators, piping, fittings, etc., should be thoroughly cleaned before the air valves are applied.

As to the size of mains, Professor Carpenter says: "The area of the main pipe must in every case be equivalent in carrying capacity to that of all the branches taken off; it consequently may be reduced as the distance from the boiler becomes greater or as more branches are supplied. It will in general be found, except when large pipes are used, less expensive to run the main full size rather than to use reducing fittings."

Find the area by multiplying the amount of radiating surface. If 1,400 feet or less, by .009; if 1,600 feet or more, by .008, and then use pipe with area nearest to that so found; thus radiating surface pipe will supply:

SIZES OF STEAM MAINS.

Radiation	One Pipe Work	Two Pipe Work
125 square feet	1½ inch	1¼×1 inch
250 square feet	2 inch	1½×1¼ inch
400 square feet	2½ inch	2 ×1½ inch
650 square feet	3 inch	2½×2 inch
900 square feet	3½ inch	3 ×2½ inch
1250 square feet	4 inch	3½×3 inch
1600 square feet	4½ inch	4 ×3½ inch
2050 square feet	5 inch	4½×4 inch
2500 square feet	6 inch	5 ×4½ inch
3600 square feet	7 inch	6 ×5 inch
5000 square feet	8 inch	7 ×6 inch
6500 square feet	9 inch	8 ×6 inch
8100 square feet	10 inch	9 ×6 inch

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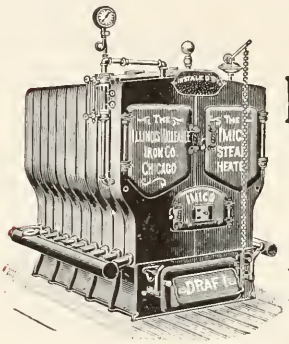
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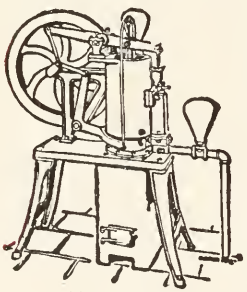
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HOT-WATER HEATING.

Heating by means of hot water has been in universal use for a number of years. There are two principal systems of hot-water heating—the open tank, or low pressure, and the closed tank, or high pressure.

In the open-tank system the water can never be hotter than 212° F., while in the closed tank it may be considerably higher, depending entirely upon the amount of pressure carried on the system.

In determining the size of a boiler required for a hot water job it must be borne in mind that all piping, including mains and risers, both flow and return, should be figured as radiating surface and added to the radiating surface of the radiators themselves. When a hot water back consisting of either a coil of pipe or a cast iron section is introduced into the fire pot for the purpose of heating water for domestic use, it must also be taken into consideration in determining the size of the boiler.

Hot water heating apparatus cannot be too generous in its proportions, as low temperatures depend upon the size of the radiators, and slow combustion depends upon the size of the boiler. Slow combustion means economy. Comparing size of radiators with those of the steam apparatus, they should be at least as 8 is to 5, that is to say, that a radiator for hot water for a given space should be three-eighths larger than one for steam to heat the same space. It should be understood, also, that all hot water apparatus is always under pressure to the extent of the height of the column of water, one pound pressure for every 27 inches of height of the column.

In the open tank system the basement piping consists of supply and return mains of the same size running parallel or with return directly under the flow pipes and pitching upward from the boiler. What is known as the trunk system consists of one supply and one return main of equal size. These are run in pairs and each radiator has supply and return of same size.

The closed tank system is now used only in car heating and in forced circulation systems for factory heating. In the car heating systems, pressure is prevented from rising to a disastrous point by the installation of some sort of top valve, usually controlled by a rubber ball or brass spring. On account of the liability of this system to freeze up when the cars are thrown on the side-track, the water is usually made 25% standard saturated salt solution.

In factory heating where the buildings cover a large area of ground or are separated, it is very desirable to heat them with hot water forced circulation. In this way waste heat from almost any source can be utilized to heat the hot water. This not only allows the buildings to be maintained at a constant temperature, but also reduces the cost of heating by the utilizing of this waste heat. Systems of this character have been installed with as high as 500,000 sq. feet of radiation.

Each radiator has a valve and union ell at the opposite end of it. If one main only is used the radiators on first floor should be supplied direct and should have larger connections. Radiators on the second and upper floors can be supplied from one branch. The ends of supply and return should be larger than the supply riser.

To find the area of mains multiply the radiating surface: When 1,800 feet and less, by .011; when 2,000 feet and over, by .009.

Size of Main.	Area.	Direct Radiation Will Supply, Feet.	Indirect Radiation Will Supply, Feet.
1½ inches	2.03	200	135
2 inches	3.35	325	200
2½ inches	4.78	450	300
3 inches	7.38	700	450
3½ inches	9.82	900	600
4 inches	12.73	1200	800
4½ inches	15.93	1500	1000
5 inches	19.99	2000	1200
6 inches	28.88	3000	2000
7 inches	38.73	4200	2800
8 inches	50.03	5600	3600
9 inches	63.63	7000	4600
10 inches	78.83	8500	5600

In the case of water being used, an expansion tank is necessary, for as the temperature of water rises until at the boiling point it is 5 per cent. greater than at 40 degrees the increase must be provided for, so that when cooled the system will still be full of water. It should be placed at a point above the highest radiator, the supply and return

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to it being connected to the supply and return of the nearest radiator, at a point below the radiator connection. No valves should be placed at any point that can possibly close the connection between the boiler and the tank.

To find the size of tank in gallons required, multiply the square feet of surface in the radiators, if the amount is less than 1,000 square feet, by .03; between 1,000 and 2,000 square feet., by .025; over 3,000 square feet, by .02.

An altitude gauge placed near the boiler will save watching the expansion tank. Fill the expansion tank to a point half way up the glass, and set the red hand of the gauge to indicate that point, and the movement of the movable hand will indicate the relative position of the water in the tank.

Ascertain the dimensions of room, the number of square feet of glass surface in windows and outside doors, figuring these doors as if glass, and measuring the entire opening of windows and door-frames. Ascertain the square feet of exposed wall surface. and deduct the glass surface as obtained above, and this will be the net amount of wall exposure. Reduce the wall surface to the equivalent of glass surface by dividing the net amount of wall exposure by 10 if the wall is from 8 to 10 inches thick, by 15 if from 12 to 26 inches thick, and by 20 if the wall is 26 to 38 inches thick. This result, added to the glass exposure, gives the glass equivalent of the glass and wall exposure. Multiply this glass equivalent by 75 (the cubic feet of air that each square foot of glass will cool per hour), and the product is the cubic feet of air to be heated to overcome the cooling effect of the glass and wall exposure. Now add to this the cubic contents of the room, and we have the total quantity of air to be heated.

In localities where the temperature falls below zero, add to the amount of radiation obtained 1 per cent. for every degree below zero.

For Hot Water.—For temperature of water in radiators, 160 degrees, multiply by .0092; water in radiators, 170 degrees, multiply by .0081; water in radiators, 180 degrees, multiply by .0072.

For water use the multiple .0092; for if water is 175 degrees in flow and 145 degrees in return, the average is 160 degrees in radiation.

This is based upon using direct radiation, and provides for one change per hour. For more frequent changes increase the cubic contents by as many times as it is desired to change the air, the multipliers remain the same.

Direct radiation is surrounded by warm air, but cold air comes in contact more or less with their surfaces, in direct-indirect and indirect systems, so that for direct-indirect add 25 per cent. and for indirect 50 per cent.

FOR STEAM, EXAMPLE FOR DIRECT RADIATION.

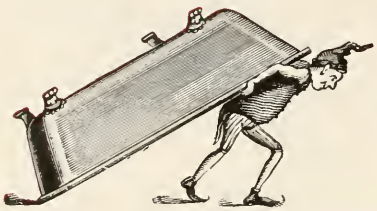
Room— 16 feet wide, 20 feet long, 10 feet high.
4 windows, 3 feet wide, 5 feet high.
2 sides of room exposed to 0° weather.
10 inches thickness of wall.
$16 \times 20 \times 10 = 3200$ cubic feet of air in room.
$3 \times 5 \times 4 = 60$ square feet of glass in windows.
$16 + 20 \times 10 = 360$ square feet of wall surface exposed, including glass.
$360 - 60$ (glass) $= 300$ square feet actual amount of exposed wall surface.
$300 \div 10 = 30$ — glass equivalent in wall exposure.
$30 + 60 \times 75 = 6750$ — air in cubic feet cooled by windows and walls.
$3200 + 6750 = 9950$ — total in cubic feet of air to be heated.
$9950 \times .0055$ (multiplier for steam) $= 54.72$ radiation in square feet required to heat room.

Indirect radiation is adopted where a large amount of ventilation is desired. It is particularly necessary in schools, hospitals and churches. and in dwellings one or two indirect stacks are desirable. This method of heating is decidedly more expensive than all direct radiation, and consumes more coal. It is frequently used in combination with direct radiation, and in this case ventilating flues must be provided. Either fireplaces or special flues from each apartment so warmed to the open air, and these flues (as well as from those conducting heat) must be placed in inside walls or partitions.

In installing this system the heating stacks are placed in the basement, connected to main supply and return pipes and encased with either galvanized iron, or narrow ceiling lined with tin. The cold air is introduced through air ducts from the outside, and after being warmed by contact with the indirect heating surfaces, is introduced into the rooms through tin flues and registers.

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Kent gives the following:

The commonly accepted theory of chimney draught, based on Peclet's and Rankine's hypotheses (see Rankine, S. E.), is discussed by Prof. De Volson Wood in Trans. A. S. M. E., Vol. XI.

Peclet represented the law of draught by the formula

$$h=\frac{u^2}{2g}\left((1+G+\frac{fl}{m}\right)$$

in which "h" is the "head," defined as such a height of hot gases as, if added to the column of gases in the chimney, would produce the same pressure at the furnace as a column of outside air, of the same area of base, and a height equal to that of the chimney;

"u" is the required velocity of gases in the chimney;

"G" a constant to represent the resistance to the passage of air through the coal;

"l" the length of the flues and chimney;

"m" the mean hydraulic depth or the area of a cross-section divided by the perimeter;

"f" a constant depending upon the nature of the surfaces over which the gases pass, whether smooth, or sooty and rough.

Rankine's formula (Steam Engine, p. 288), derived by giving certain values to the constants (so-called) in Peclet's formula, is

$$h=\frac{\frac{T_o}{T_2}(0.0807)}{\frac{T_o}{T_1}(0.084)}H-H\quad(0.96\frac{T_1}{T_2}-1)H$$

in which H= the height of the chimney in feet;

T_o = 493° F. absolute (temperature of melting ice);

T_1 = absolute temperature of the gases in the chimney.

T_2 = absolute temperature of the external air.

SIZES FOR CHIMNEYS.

A very essential adjunct to the working of a plant is the chimney flue, and the form of the flue has much to do with its effectiveness; thus as gases ascend in a spiral motion a round flue is the best, and a square one is better than one of rectangular shape. If of brick it should be evenly plastered. The flue should extend below the smoke pipe connection only a short distance to permit the removal of soot, if continued far below it will form an air pocket and cause down currents.

Square Feet of Direct Steam Radiation.	Horse Power.	Size of Chimney.	Square Feet of Direct Water Radiation.
250	2.5	8″x 8″x25′	400
500	5.0	8″x12″x30′	850
800	8.0	12″x12″x35′	1350
1400	14.0	12″x16″x40′	2400
2200	22.0	16″x16″x50′	3700
3500	35.0	18″x18″x60′	5900
5500	55.0	20″x20″x70′	9300
8000	80.0	24″x24″x80′	13000

FORMULA FOR CALCULATING RADIATION.

The following is successfully used by a prominent member of the C. A. B. A.:

First ascertain the cubical contents, glass surface (which includes the surface of all exterior doors and windows), take into account whether N., S., E. or W.

Let "I" be the inside temperature desired, say 70° Fahrenheit, "E" the coldest exterior temperature, "V" volume of room in cubic feet, "W" exterior wall surface of room in square feet, "G" exterior windows and doors in square feet, "R" standard amount of surface radiation in square feet, "F" factor depending upon method of heating or particular story heated. When hot water overhead system is used: 4 story building, adopt 1.3 for first story, 1.2 for second, .90 for third and .60 for fourth. In 3 story buildings, 1.25 for first, 1 for second and .75 for third. For 2 story, 1.2 for first and .8 for second.

When the steam heating method is used, "F" becomes a constant equal to .8. "J" factor depending upon exposure equal to 1.4 for N., W. and N. W. exposures, equal to 1.2 for N. E. and S. W. exposures, equal to 1 for E., S. and S. E. exposures, and also for

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small interior courts and places well protected from north and west winds. For bathrooms where a higher temperature is usually desired J is often made 2 instead of the usual rule. Kitchens where coal ranges are used, "J" is often made as low as .5, usually .75; but where there are no coal ranges "J" should be made 1-10 less than the factor obtained for the above.

$$\left\{\frac{V}{400}+\frac{W}{10}+\frac{G}{2}\right\}\left\{\frac{I\text{-}E}{I}\right\}.9 = R.$$ Q equals the desired square feet direct radiation surface for a room. Q=R F J. "E" is usually taken as 10° higher than the minimum recorded temperature of the locality. "I" is taken as 70°, therefore the quantity $\left\{\frac{I\text{-}E}{I}\right\}.9$ becomes a constant for any given locality, for Chicago where the minimum temperature is minus 20° the quantity is taken at 1.03.

The diameter of all supplies in inches should not vary materially from the square root of the amount of radiation to be supplied by the pipe, divided by 100. Reduced to inches, this rule is equally applicable to the supply of a single radiator or the supply of an entire system. Good judgment must go with the use of all empirical formula, especially in the use of the factor "J," which might be called the judgment factor. Location of surrounding buildings, trees, open space, etc., should be considered in the selection of a value for "J." "W" should include area of ceiling in case of top story rooms or of rooms where the room above is not heated.

AUTOMATIC HEAT REGULATION.

Automatic heat regulation is now recognized as a very convenient item in the equipment of modern buildings.

Its application naturally depends upon the character of the heating apparatus, it being essential in all cases that each heated apartment be supplied with at least one of the temperature controlling instruments called "thermostats," this "thermostat" regulating automatically the sources of heat supply for the apartment in which it is placed.

If the system of heating be direct radiation, the control of the radiators is accomplished by means of pneumatic diaphragm valves taking the place of the ordinary hand valves, these pneumatic valves being connected with the "thermostat." If indirect heat is used, the passage of the warm air through the heat flues is usually controlled by "mixing dampers," so arranged as to automatically mix hot and cold air in the proper proportions before it reaches the apartment, these mixing dampers being under the control of the "thermostats."

The heat regulation systems of recognized standing are generally operated by compressed air supplied by a suitable compressor in the basement, and distributed throughout the building by a system of galvanized iron and lead piping. The manufacturers of these systems invariably install the apparatus themselves, either as principal or sub-contractors, but in all cases executing to the owner a guarantee covering the operation and care of the system. The evidence seems to show that a saving of from 15 to 25 per cent in fuel consumption is accomplished in those buildings which are equipped with automatic heat regulation. This is a sufficiently large return upon the cost of the apparatus to justify its use in the majority of buildings. In residences, schools, etc., its use is imperative for hygienic reasons as well.

Specifications for temperature regulation should cover the system of piping to be installed minutely, as on the method of piping, and the size and kind of pipe used, depends, in a great measure, the success and durability of the system.

In connection with automatic control of temperature, there is also the control of the humidity of buildings, produced by artificial means. The question of humidity is a matter of great importance in buildings, and it is only since the invention of temperature regulation and the control of humidity that the device for producing humidity can be successfully installed.

Refer to File 697, Tables of Miscellaneous Information in the back part of this book for tables.

VENTILATION.

Kent gives the following:

"The popular impression that the pure air falls to the bottom of a crowded room is erroneous. There is a constant mingling of the fresh air admitted with the impure air, due to the law of diffusion of gases, to difference of temperature, etc. The process of ventilation is one of dilution of the impure air by the fresh, and a room is properly ventilated, in the opinion of the hygienists, when the dilution is such that the carbonic acid in the air does not exceed from 6 to 8 parts by volume in 10,000. Pure country

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air contains about 4 parts CO_2 in 10,000, and badly ventilated quarters as high as 80 parts."

An ordinary man exhales 0.6 of a cubic foot of CO_2 per hour. New York gas gives out 0.75 of a cubic ft. of CO_2 for each cubic foot of gas burned. An ordinary lamp gives out 1 cubic foot of CO_2 per hour. An ordinary candle gives out 0.3 cubic foot per hour. One ordinary gaslight equals in vitiating effect about 5½ men, an ordinary lamp 1 2-3 men, and an ordinary candle ½ man.

It is exceptional that systematic ventilation supplies the 3,000 cubic feet per inmate per hour, which adequate health considerations demand. Large auditoriums, in which the cubic space per individual is great, and in which the atmosphere is thoroughly fresh before the rooms are occupied and the occupancy is of two or three hours' duration, the systematic air supply may be reduced, and 2000 to 2500 cubic feet per inmate per hour is a satisfactory allowance.

Hospitals, where, on account of unhealthy excretions of various kinds, the air dilution must be largest, an air supply of from 4000 to 6000 cubic feet per inmate per hour should be provided, and this is actually secured in some hospitals. A report dated March 15, 1882, by a commission appointed to examine the public schools in the District of Columbia, says:

"In each class room not less than 15 square feet of floor space should be allotted to each pupil. In each class room the window space should not be less than one-fourth the floor space, and the distance of desk most remote from the window should not be more than one and a half times the height of the top of the window from the floor. The height of the class room should never exceed 14 feet. The provisions for ventilation should be such as to provide for each person in a class room not less than 30 cubic feet of fresh air per minute (1800 per hour), which amount must be introduced and thoroughly distributed without creating unpleasant draughts, or causing any two parts of the room to differ in temperature more than 2° F., or the maximum temperature to exceed 70° F."

When the air enters at or near the floor it is desirable that the velocity of inlet should not exceed 2 feet per second, which means larger sizes of register openings and flues than are usually obtainable, and much higher velocities of inlet than 2 feet per second are the rule in practice. The velocity of current into vent flues can safely be as high as 6 or even 10 feet per second, without being disagreeably perceptible.

The entrance of fresh air into a room is co-incident with or dependent on the removal of an equal amount of air from the room. The ordinary means of removal is the vertical vent-duct, rising to the top of the building. Sometimes reliance for the production of the current in this vent-duct is placed solely on the difference of temperature of the air in the room and that of the external atmosphere; sometimes a steam coil is placed within the flue near its bottom to heat the air within the duct; but more often exhaust fans, driven by steam or electric power, act directly as exhausters.

RULES FOR PROPORTIONING RADIATION AND MAINS.

Professor R. C. Carpenter, of Cornell University, submits the following rule for determining the size Radiator needed for a given room:

Rule: Add the area of the glass surface in the room to one-quarter of the exposed wall surface and to this add from 1/55 to 3/55 of the cubical contents (1/55 for rooms on upper floor, 2/55 for rooms on first floor and 3/55 for large halls); then for steam multiply by .25 and for hot water .40.

Example: A room 20 × 12 × 10 feet with glass exposure of 48 feet, ¼ of wall exposure (two sides exposed) 320 feet = 80, 1/55 of 2,400 = 44.

48 + 80 + 44 = 172 × .25 = 43 feet.

If you add 2/55 the surface would be 54 feet.

If you add 3/55 the surface would be 65 feet.

A rule which has been adopted by many leading heating engineers and which can be followed with confidence in proportioning radiation, is as follows:

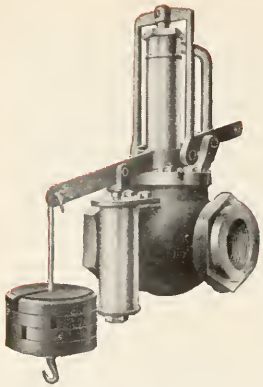
Allow 1 sq. ft. of radiation for 2 sq. ft. of glass.

Allow 1 sq. ft. of radiation for 20 sq. ft. of exposed wall.

Allow 1 sq. ft. of radiation for 200 cu. ft. of contents.

The sum of these amounts would represent the number of feet of heating surface it would require for steam. For hot water add 70%. This is based on a temperature of 70° with the outside temperature 10° below zero.

Another rule adopted by many heating engineers is to add to the glass surface 10% of the wall surface and multiply this sum by 75 and, to this amount add the cubical contents of the room. For hot water radiation multiply this sum by .0092, for steam by .0055.



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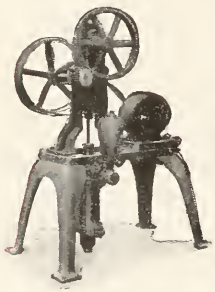
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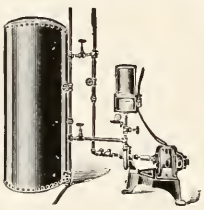
PUMPING MACHINERY



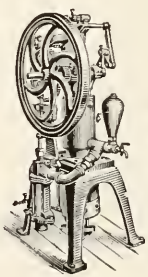
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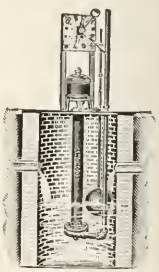
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This is based on a temperature of 70° with the temperature outside at zero. In localities where the temperature falls below zero, add to the amount of radiation obtained, 1% for every degree below zero.

TABLE OF EQUIVALENT TEMPERATURE FOR TESTING A HEATING PLANT AT DIFFERENT OUTSIDE TEMPERATURES.

For the purpose of indicating the efficiency of the apparatus for any specified condition, Prof. Carpenter gives the following table, which has been generally accepted as the standard test.

For steam, the Radiator temperature in all cases is assumed to be that due to a pressure of 3 lbs. at the boiler, or about 220° Fahr.

For water, the Radiator temperature is assumed in all cases to be at an average or 160° Fahr.

For a plant proportioned sufficiently to maintain a temperature of 70° when the outside temperature is at zero.

Temperature of Outside Air	Room should be raised to	Temperature of Outside air	Room should be raised to
—10	64.7	50	98.7
0	70.0	60	104.7
10	75.1	70	110.5
20	81.0	80	117.1
30	86.5	90	123.5
40	93.1	100	130.3

See University of Illinois Engineering Experiment Station Bulletin No. 31 for methods and results of tests on house heating apparatus. These tests have been made on different kinds of house heating apparatus with different kinds of fuel. The bulletin embodies the results of about three hundred tests. These bulletins are for free distribution.

EXPANSION AND CONTRACTION.

Scarcely anything can withstand the expansion of iron. It expands from 23° to 212°, about 1/900 of its length, which in 100 feet equals 1⅜ inches. The expanding power of a 2-inch pipe when heated to a temperature of 100 pounds steam, or to 338°, exerts a force sufficient to move 25 tons.

Cast iron expands 1/162000 of its length for each degree Fahr. it is subjected to within ordinary limits while in its solid state.

Wrought iron expands 1/150000 of its length for each degree Fahr. To find the expansion of a line of pipe, multiply its length in inches by the number of degrees of temperature applied and divide the product by 150,000 for required expansion in inches; thus $100' \times 12'' = 1200 \times 338° = 405600 \div 150000 = 2.7$ inches.

Special attention, then, must be given to the expansion and contraction of pipes and allowance made for it. Pipes and branches must be unconfined, especially in the direction of their length.

Expansion joints should not be used if the expansion can be compensated for in any other way.

RADIATION OF HEAT.

Radiation of heat takes place between bodies at all distances apart, and follows the laws for the radiation of light.

The heat rays proceed in straight lines, and the intensity of the rays radiated from any one source varies inversely as the square of their distance from the source.

This statement has been erroneously interpreted by some writers, who have assumed from it that a boiler placed two feet above a fire would receive by radiation only one-fourth as much heat as if it were only one foot above. In the case of boiler furnaces the side walls reflect those rays that are received at an angle—following the law of optics, that the angle of incidence is equal to the angle of reflection,—with the result that the intensity of heat two feet above the fire is practically the same as at one foot above, instead of only one-fourth as much.

The rate at which a hotter body radiates heat, and a colder body absorbs heat, depends upon the state of the surfaces of the bodies as well as on their temperatures. The rate of radiation and of absorption are increased by darkness and roughness of the surfaces of the bodies, and diminished by smoothness and polish. For this reason the covering of steam pipes and boilers should be smooth and of a light color: uncovered pipes and steam-cylinder covers should be polished.

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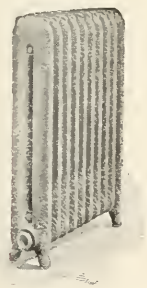
The quantity of heat radiated by a body is also a measure of its heat-absorbing power, under the same circumstances. When a polished body is struck by a ray of heat, it absorbs part of the heat and reflects the rest. The reflecting power of a body is therefore the complement of its absorbing power, which latter is the same as its radiating power.

The relative radiating and reflecting power of different bodies has been determined by experiment, but as far as quantities of heat are concerned, says Prof. Trowbridge (Johnson's Cyclopaedia, art. Heat), it is doubtful whether anything further than the said relative determinations can, in the present state of our knowledge, be depended upon, the actual or absolute quantities for different temperatures being still uncertain. The authorities do not even agree on the relative radiating powers.

HEATING BY ELECTRICITY.

If the electric currents are generated by a dynamo driven by a steam engine, electric heating will prove very expensive, since the steam engine wastes in the exhaust steam and by radiation about 90 per cent of the heat units supplied to it. In direct steam heating, with a good boiler and properly covered supply pipes, we can utilize about 60 per cent of the total heat value of the fuel. One pound of coal, with a heating value of 13,000 heat units, would supply to the radiators about 13,000 x .60=7800 heat units. In electric heating, suppose we have a first class condensing engine developing 1 H. P. for every 2 lbs. of coal burned per hour. This would be equivalent to 1,980,000 ft.—lbs.÷778=2545 heat units, or 1272 heat units for 1 lb. of coal. The friction of the engine and of the dynamo and the loss by electric leakage, and by heat radiation from the conducting wires, might reduce the heat units delivered as electric current to the electric radiator, and these converted into heat to 50 per cent of this, or only 636 heat units, or less than one-twelfth of that delivered to the steam radiators in direct steam heating. Electric heating, therefore, will prove uneconomical unless the electric current is derived from water or wind power, which would otherwise be wasted.

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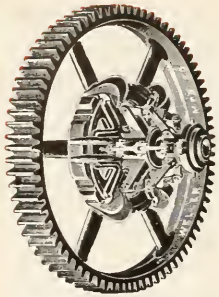
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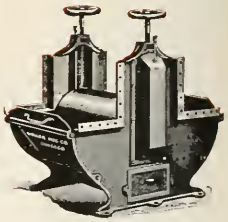
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CONVEYING MACHINERY IN CITY BUILDINGS.

By Staunton B. Peck.

It is the purpose of this article to show some applications of elevating and conveying machinery in city buildings, such as Railroad Stations, Warehouses, Wharfs, Wholesale and Retail Mercantile Establishments, Hotels, Office Buildings, Electric Light, Street Railway and other Power Houses.

It is with this class of buildings on land valued by the square foot rather than the acre, and where space is to be utilized to the very best advantage, that the architect is most concerned: and a knowledge of conveying machinery and its intelligent use may be the most important factor in determining the possibilities of a given space. While the ordinary conception of such machinery is as a money saver by reducing labor cost, this in a city installation may well be secondary to securing the greatest utility or enabling the most to be accomplished in a particular building with its limitations of size, height and occupied floor area.

Two illustrations follow of methods of handling the coal into and ashes from power houses:

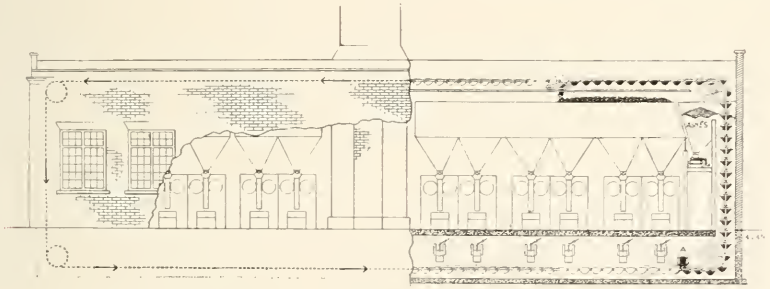


Figure 1.

Figure 1 is a typical modern arrangement where the boilers are on practically ground level and reasonable space has been available. The pivoted or gravity bucket conveyor is almost universally used because of its simplicity and durability; its freedom from noise and vibration; and because the one machine handles successfully both coal and ashes, and serves to both convey and elevate, thus requiring the minimum of space, of depth and of attention. Figure 2 illustrates the boiler room and coal storage space of a large building in Chicago, where, as in all "sky-scrapers," floor space at the street level is too valuable for boilers, and they have to be in the basement, or more commonly in sub-basements. The complex machinery equipment of one of these great structures, for elevators, water supply, light and ventilation, occupies so much of a space already reduced by massive walls and foundations, that the facilities for handling coal and ashes are apt to be cramped in the extreme, and the wise engineer or architect will see that due consideration is given to this before his plans proceed too far; otherwise, even though he avails himself of the aid of elevating and conveying devices, he will fail to get the greatest efficiency, durability and economy, not to mention convenience.

Where ashes have to be elevated from basements, and delivered into wagons on the street, telescoping elevators, as shown in Figure 3, have proved very serviceable. This elevator may be extended by power, up through opening in the alley or sidewalk, and similarly lowered out of the way when not in use, the opening being closed by cover plate so as to offer no obstruction to traffic. Where the lift is a very high one

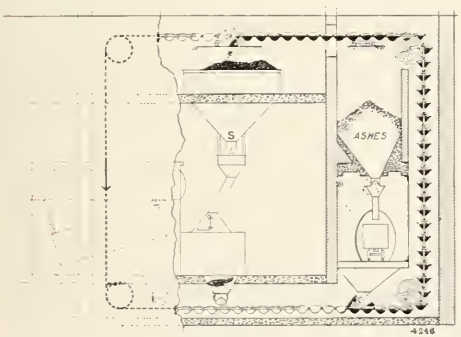


Figure 2.

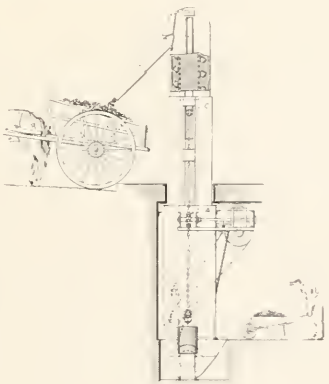


Figure 3.



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from some of the very deep sub-basements of the present day, a fixed elevator may be used to raise the ashes and deliver into the telescoping one, the lift of the latter being thus a minimum.

In high buildings a large amount of valuable floor space has to be sacrificed for the elevators in an increasing ratio with the height of the building. Every elevator saved means a gain of its allotted space **on every floor.** Continuous elevators, figure 4, with suspended trays between the chains occupy less space than the average platform elevator and have a capacity equal to 4 to 6 of the latter, besides dispensing with the constant service of the operators. To what advantage these elevators may be used can thus readily be appreciated, and they play an important part in wholesale dry goods and grocery houses, department stores, mail order houses, freight depots and wharfs, breweries, and in fact all industrial establishments handling boxes, barrels, sacks, or packages of any sort in quantity. These elevators are so arranged that by an inter-meshing of the trays and floor skids they pick up or deliver automatically at any desired floor.

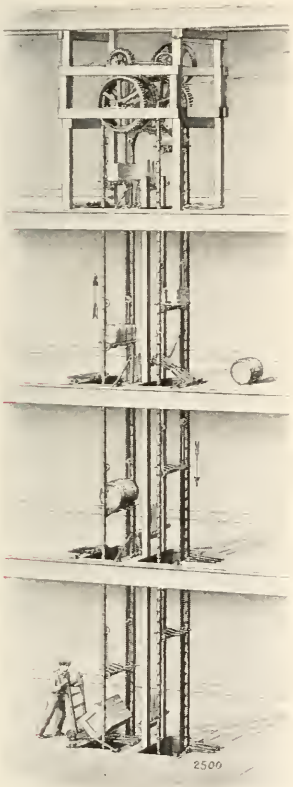


Figure 4.

Similar elevators of the same or modified form as shown in figure 5 are used to great advantage in department stores for receiving purchases on every floor, and delivering to the common shipping room in the basement. From the delivery point in the basement, diverging belt conveyors, or a system of belt conveyors are an invaluable aid in relieving natural congestion of a busy and crowded shipping room. A well arranged system of such conveyors by the facility it affords for sorting and distributing to the proper bins or compartments, enormously increases the shipping capacity of a given floor, reduces the number of mistakes, and is recognized as essential in a well organized business. Most of these conveyors may be suspended from the ceiling, where, enclosed in steel casings, they are out of the way and absolutely noiseless.

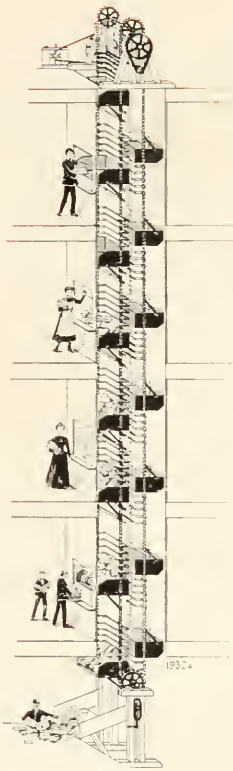


Figure 5.

Short inclined conveyors for taking merchandise from basement to sidewalk for loading into wagons are well known and widely used. These may be a continuous moving wooden platform, with or without cleats at intervals, or consist merely of two parallel chains with cross bars at intervals, or with pushers to push small truck loads; or they may be of special design for individual duties. These truck carriers are indispensable on wharfs where freight has to be trucked from side ports of vessels to a warehouse floor, which, owing to the draft of the vessel or condition of tide may be at a higher level. Figures 6 and 7.



Figure 6.

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Figure 8 shows a large warehouse occupying both sides of the street with a connecting tunnel beneath. The use of a conveyor, which is practically an endless traveling platform, through this tunnel, not only dispenses with a large number of truckers and possibly the necessity for more than one tunnel, but renders of no practical consequence the difference in levels which would make hand trucking most laborious, if not altogether prohibitive.

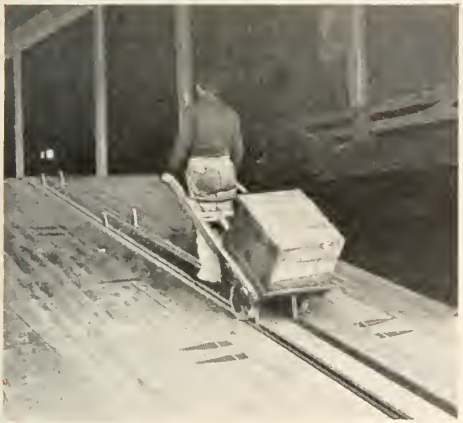


Figure 7.

Figure 9 is a long conveyor for heavy barrels from a refinery to dock, the dock end being hinged to accommodate it to varying heights of vessels. Under such conditions as this installation shows, it is apparent that the first cost of the carrier may be saved in a few months, and a further advantage is the expediting of the loading and dispatching of the vessel.

In newspaper printing rooms the papers come from the presses with such rapidity that conveyors for taking them away with equal rapidity are virtually a necessity, as well as money savers. Figure 10 shows a typical illustration subject to a very great modification to meet individual conditions.

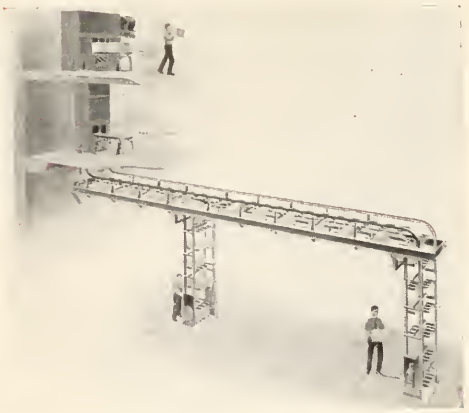


Figure 10.

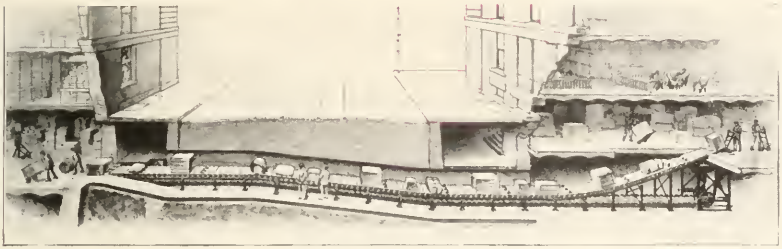


Figure 8.

The above illustrations and notes merely serve to call attention to a few of the commoner utilities of conveyors in cities, but it is hoped will prove suggestive to architects and engineers. Their use in many a confined situation affords admirable opportunity to make the proverbial "two blades of grass grow where one grew before."

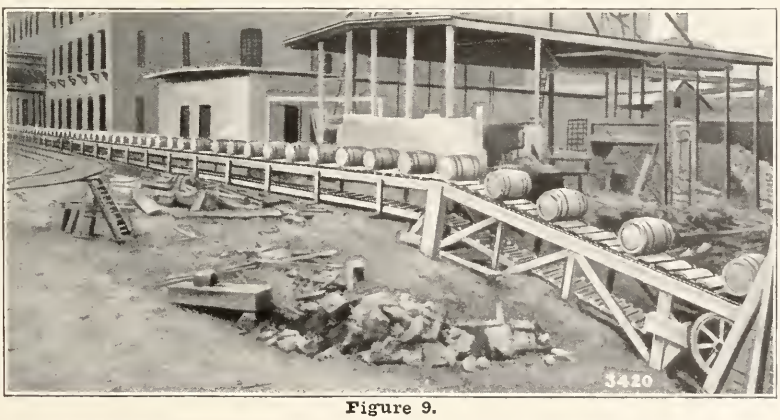


Figure 9.

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POINTS ON VARNISH.

BY HERMAN ROSENBERG

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Turning White.—It is caused by the action of water and dampness. The more elastic the varnish, the better it will resist this action, whereas, cheap, brittle, quick-drying varnishes are very easily affected.

Brittleness.—Is an inherent defect in the varnish caused by an excess of dryer, lack of oil, or by adulterated materials having been used in its manufacture. If a varnish powders white under friction of the finger or easily scratches white, that is incontrovertible evidence of its poor quality. Brittle varnishes should not be used even for the undercoats, as they destroy the toughness and durability of the finish, despite its being protected with an elastic, durable finishing varnish. It is poor economy, in any event, to use brittle varnishes, as the cost of application, which is the main expense, is the same as if good material were employed.

Chilling.—As its name implies, is caused by exposure to cold weather. Varnish should never be used while in this condition. To remedy is to keep the chilled varnish in a warm room, until it has been restored to its normal condition. Long exposure to cold weather may also cause the varnish to become "specky" and "seedy." in which event it is necessary to keep it near a steam pipe or warm stove for some time, until the chilled particles have disappeared.

Cracking.—Cracking is caused by the under coats not having been dry when the finishing coat was applied, or when abnormally heavy coats have been used, especially for the undercoats. Brittle varnishes are liable to crack when exposed to sudden changes of temperature.

Blooming or Going Foggy.—Is caused by exposure to dampness, moisture or gases, after the varnish has become hard. The more elastic the varnish, the less liable it is to "bloom" or become "foggy."

Wrinkling, Crawling, Cramping or Sagging.—Is caused by applying the varnish too heavily or by exposure to sudden changes of temperature while in the process of drying, or if the undercoats are not dry when the finishing coat is applied.

Deadening or Sinking Away.—Caused by the undercoats not having been allowed sufficient time to dry, causing the finishing coat to become absorbed while in the course of hardening. Insufficient foundation coats will also cause the finishing to sink away.

Blistering.—Is caused by the action of heat, especially from the concentrated rays of the sun, if sap or dampness is retained in the wood, or if moisture exists in the undercoats when the finishing coat is applied.

Pitting.—Is caused by applying varnish over an oily or damp surface; also, if the varnisher is not careful to thoroughly incorporate the turpentine in reducing the varnish, or uses improper thinning material.

Knots and Sappy Woods.—The sap and knots should be "killed" by the use of grain or wood alcohol shellac for the first coat. If this is not done, the sap will work through and injure the finish.

Thinning.—When found necessary, should be done with spirits of turpentine. In order to insure proper amalgamation, neither the varnish nor the turpentine should be too cold when mixing. The warmer the varnish and turpentine, the quicker the amalgamation. After reducing the varnish, allow it to stand awhile before using. Oil, Japan or liquid dryer should never be added to varnish.

SWEATING.—Is caused by rubbing the undercoat before it is thoroughly dry.

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FINISHING OF WOODS.

By W. S. Potwin.

Modern methods of treating the different woods used in the interiors of buildings are greatly in advance of those in vogue twenty-five years ago, when painting, or enameling, as the better class of finish was called, was almost universally the mode. Occasionally a clear varnish was applied upon the natural wood in order to preserve the original grain, and this was certainly preferable to the prevailing style of painting interior woodwork in many colors or in staring white.

A notable advance marking modern methods is in the beautiful wood stains which have been brought out, the best class of these goods possessing great charm and durability. Many are ephemeral in character and often show effects best described by the word "daub." In other words, they do not show the clear, beautiful grain which nature supplies, covering up instead of developing the matchless tones hidden in the wood. The best grade of these finishes impart a beautiful color to the natural wood and bring out the exquisite lights and shades as well as the delicate grain.

Again, improvements have been made in what are usually known as enamels, the finish so fashionable in colonial days and which gave such dignity to the interiors of the best houses. They were simply the best quality of white pigments then obtainable and not infrequently turned yellow with age. Enamels are now manufactured of the highest grade in texture, purity of tone and durability. With these a skillful mechanic can produce most charming effects. Such materials are not to be found in every shop, as the majority of manufacturers are too apt to consult the interest of their own pockets rather than that of their patrons.

For some years the artistic home builder has more and more wearied of high lustre finishes for natural woods, until at length, by gradual steps, he has reached the true artist's point of view and asks for Nature's simple garb,—the quiet restful tones of unfinished woods. To satisfy this craving, a new material has been brought out by a varnish manufacturer, which has proven most satisfactory both as to durability and the beauty of the finished surface. When applied it seems to develop the beauty of the wood greatly, without producing any appearance of varnish. So perfect is the illusion that many experts have been so deceived as to declare that a surface protected by it had never received any finish whatever. It does not obscure the varying lights and shades of natural or stained woods, and yet is a perfect protection indoors.

A wax finish for interior standing work is very attractive, when kept in perfect condition, but this is costly and entails the frequent intrusion of workmen. Moreover, it is decidedly unsanitary, and for that reason, if for no other, should be condemned. A case in point is the abolition of all wax on the floors of hospitals, sanitoriums, etc., the germs lodging in the successive coatings numbering millions. The late King Edward VII of England would not enter a house having waxed floors. A beautiful wax finish is now available in which not a grain of wax is used. It is in fact a pure varnish, so carefully and skillfully compounded as to produce a perfect wax effect, but wholly devoid of the evils resulting from the genuine wax solutions.

The very best materials for finishes are sometimes condemned as failures through the lack of proper knowledge on the part of the workman who applies them; or through the unwise hurrying of the interior finishing, which, being the last, often receives the least attention, when, in fact, next to the foundation, there is no part of the work which calls for more careful handling to secure the best results.

One serious obstacle the manufacurer has to contend with is the reduction of his products by the workmen applying them. The benzine can should be prohibited "on the job," as varnish, when it leaves the factory, is ready for use, and if good results are to be obtained it should be applied just as it comes from the maker.

Another grave situation (when the interests of the client are considered) has developed in comparatively recent days, to-wit: The contractor for the wood-finishing demurs to the specification of a particular brand of varnish, saying that if he

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is permitted to use his own judgment in the selection of materials he will guarantee satisfaction, otherwise the architect must assume the risk. The "satisfaction guaranteed" is often transitory, as the owner discovers when he is compelled within two or three years to have the work repaired or completely renewed owing to the cheap materials used. A really high grade varnish may last even in public buildings ten to fifteen years and in private residences twenty-five years or longer. Does it pay to use the best materials? In hardware, tin roofing, etc., is the selection of materials left to the contractor?

Excessive moisture in a building will result disastrously to the finish. This may be easily proven by finishing completely one half of a piece of the wood to be used, in the contractor's shop, and the other half in the building itself, where the air is laden with the dampness arising from wet plaster, fire-proofing, etc. The difference in the results obtained will be thoroughly convincing. The part finished in the building immediately begins to take up dampness; the stain darkens and loses its color; the grain begins to rise and the foundation for the rich, smooth finish anticipated is destroyed.

The utmost care must be exercised in the finishing of all sash and window trim to guard against moisture. All exposed surfaces of the entire trim of windows and outer doors should be thoroughly painted at the mill to prevent the ruin of the interior finish by moisture arising from masonry, beating storms and condensation of dampness in the atmosphere upon the glass, whence it runs down over the sash along the outer edge of the sill and follows the unprotected grain of the wood wherever found. This inevitably results sooner or later in the flaking, crumbling or perishing of the interior finish, entailing great expense and annoyance upon the owner to correct. This is especially true of enamel finish. Work finished in the mill before going into the building should have in addition to the stain one coat of thoroughly reliable interior varnish to protect it against the effects of moisture.

Dampness in the floors prevents the varnish from penetrating deeply, causing it to dry only on the surface, thus destroying the extreme toughness obtainable when properly applied under favorable conditions.

The action of moisture upon the filler is to cause the oil to remain on the surface, producing an oily, slow-drying foundation for the later coats, instead of penetrating deeply into the wood and becoming absolutely hard, as it should.

The proper filling of the pores of the wood is an important step in finishing and here again the best material is the cheapest, though seldom used, little attention being given to this matter except by the best contractors. It is the basis of thorough satisfaction to the client. In laying the foundation of a building what would be thought of mortar having no cement in its makeup?

It is by no means rare to find a splendid building ruined in the interior finishing through inexcusable haste. There may have been annoying delays on the part of other contractors and the owner becoming impatient urges the rushing of the remaining work. The painter against his better judgment orders all haste to be made and the result is insufficient time for the successive coats of finish to harden—perhaps some are entirely omitted—and the result is disastrous. In such cases, don't blame the painter!

The contractor for the wood finishing should finish two pieces of each of the woods in use, one for the supervising architect and the other for the guidance of the workmen. No varnish should be applied when the temperature of the room is below 46° F., as it will chill and not flow evenly; its drying will also be greatly retarded. When possible the temperature should be 70° F. and kept uniform until the varnish has set; then first-class work should result. Exterior varnish should be applied before noon during cold weather, so it will set before the chill which comes near sunset.

Serious errors are sometimes made through the ignorance of workmen or the misunderstanding of label directions; therefore, when at all in doubt, write at once to the manufacturer of the finish for instructions, thus avoiding vain regrets.

Careful inspection must be given all woodwork to be enameled. It should be found thoroughly dry, free from sap and uniform in color before applying the first coat. If there are indications of sap, a coat of white shellac should be first applied and then sandpapered to remove the shellac from the fibre, leaving a coating in the pores over the sap.



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PROTECTIVE COATINGS FOR VARIOUS STRUCTURAL MATERIAL.

Excerpts from lecture delivered by Mr. Henry A. Gardner before the Chicago Architects' Business Association.

The general theme of the lecture was based upon a series of exposure tests which have been conducted by the Scientific Section of the Paint Manufacturers' Association in different parts of the United States. The object of their work is to determine the best mixtures of pigments for use in paints for the protection of various structural materials, such as wood, steel, concrete, etc. A series of 200 lantern slides were shown by Mr. Gardner, and his talk was entirely from the lantern slides, no paper being presented.

The following points of interest were noted during the lecture. An immense wooden test fence was constructed in Atlantic City, N. J., by the Scientific Section, acting in co-operation with the Master Painters' Association of Philadelphia, and later with the inspection of a special committee from the American Society for testing material. Another test fence similar to the Atlantic City test fence was constructed in Pittsburg, Pennsylvania, and this fence was under the supervision of the Master Painters' Association of Pittsburg and the Carnegie Technical Schools. Each fence was painted with nearly sixty different formulas, and each formula was painted out on three grades of wood and in three colors on both sides of the fence. After a year's wear the various inspection committees assembled at the fences and made an inspection. The results of the inspection were tabulated in chart form, and indicated certain formulas to have given excellent protection to the wood, while other formulas which had been applied were not in very good condition. For instance, it is shown that the paints made of single pigments, such as lithopone, corroded white lead or zinc oxide have given very inferior service. It was found, however, that in mixtures of more than one pigment, such as corroded or sublimed white lead and zinc oxide when used together or with a small percentage of crystalline pigments, excellent results were obtained.

Crystalline pigments, such as asbestine, barytes, silica, etc., demonstrated their efficiency when used in paints in moderate percentages. Some of the best formulas on the fences were made up of combinations of white leads and zinc oxide containing from 10 per cent to 20 per cent of the above named crystaline pigments.

The formulas which were tinted with ochre to obtain a yellow showed superiority over some of the white formulas untinted. This would apparently indicate that the ochre had some reinforcing action. As a matter of fact, ochre is chemically a silicate of iron and aluminum, containing a considerable proportion of free silica. We must, therefore, attribute the value of ochre in increasing the life of paint to silica and silicate content.

A series of tests on colors was also made, and it was found that for priming base for colors sublimed white lead and zinc oxide showed greater wearing efficiency than corroded white lead. This is no doubt due to the inert character of the sublimed lead or zinc oxide.

One of the most valuable and important pigments which the paint manufacturer relies upon in the manufacture of paints is corroded white lead, but it apparently has certain defects which must be remedied. One well known white lead expert has stated that if white lead could be improved it would be improved by making its particles much smaller in size, and that the best paint is made of the finest pigments. This conclusion offers a solution to the problem of obtaining the best pigments for a paint base, and the paint manufacturer at once grasps the opportunity of mixing with corroded white lead some finer pigments such as zinc oxide or sublimed white lead, these latter pigments being extremely fine in their particle size.

The corroded white leads showed extremely rough and eroded surfaces, with extremely deep checking. Straight zinc oxide showed heavy checking with abrupt edges. Mixtures of corroded white lead and zinc oxide showed very smooth surfaces. Sublimed white lead showed a very clear surface, almost free from checking. The panels which were painted with mixtures of corroded white lead, sublimed white lead, zinc oxide and crystalline pigments showed the best condition of surface with a minimum of checking.

The results at Atlantic City and Pittsburg were confirmed in North Dakota to a great degree and the report of the inspectors who inspected the North Dakota test fence on November 20th, 1909, bore out the conclusions reached from the other test fences, viz.: that the best paints to use in the Northwestern climate could be manufactured from mixtures of sublimed white lead, corroded white lead, zinc oxide and crystalline pigments. The checking on paints made of the above character was very slight and the general condition for re-painting most excellent when the formulas had been applied to good wood. The checking, chalking and general condition of the single pigment paint

Continued on page 265

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In rooms containing one or more horizontal angles between the floor and ceiling line, the ceiling to be measured from wall to wall, as though all walls were vertical, for contents of ceiling, and from floor to highest point of ceiling for height of wall.

OPENINGS.

Openings in plastering to be measured between grounds. No deductions to be made for openings of two feet or less in width. One-half of contents to be deducted for openings two feet or more in width. The contents on all store front openings to be deducted, and the contractor to be allowed one foot six inches for each jamb by the height.

All beams or girders projecting below ceiling line to have one foot in width by total length added for each internal and external angle.

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All corner angles of more or less than 90 degrees, beads, quirks, rule joints, and moldings, to be measured by the lineal foot on their longest extension, and one foot for each stop or miter.

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Length of cornices to be measured on walls. Plain cornices of two feet girth or less to be measured on walls by the lineal foot. Plain cornices exceeding two feet girth to be measured by the superficial foot. Add one lineal foot to girt for each stop or miter. Enriched cornices (cast work), by the lineal foot for each enrichment.

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Grounds for 3-coat lath work..... 1 inch
Grounds for 3-coat metal lath work.⅝ inch
Grounds for 3-coat metal lath work, on ½-inch iron furring.....1⅛ inch
Grounds for 3-coat metal lath work, on 1-inch iron furring.....1⅝ inch
Grounds for hard mortar metal lath work ⅝ inch
Grounds for hard mortar metal lath work, on ½-inch iron furring....1⅛ inch
Grounds for 2-coat work on brick or tile ⅝ inch
Grounds for hard mortar on brick or tile ⅝ inch
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In accordance with agreements between the International Operative Plasterers' Union and the American Brotherhood of Cement Finishers, it is agreed that Plasterers shall claim and do all exterior and interior plastering, whether of stucco, cement or any patent material, when done in and by the usual methods of plastering, including the covering of all walls, ceilings, soffits, piers, columns, or any part of a construction of any sort, when any part of a construction is covered with any plastic material in the usual methods of plastering.

In accordance with agreements between the International Operative Plasterers Union and the Ceramic, Mosaic and Encaustic Tile Layers and Helpers' International Union, it is agreed that all walls and ceilings upon which a foundation or base coat is put on by the plasterers, ample room shall be allowed for a final coat of not less than three-eighths of an inch, to be put on by the tile layers, to act as a binder and regulator for the float coat upon which the tile is placed.

It is also agreed that the plasterers shall use only sand and cement in the preparations of walls for the work as above stipulated.

It is also agreed that this shall not interfere with the right of the tile layers to do the scratch coating on all small jobs of one or two ordinary sized bath rooms. No scratch coating shall be put on except by mechanics of either trade.

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AMERICAN EXPRESSION IN ARCHITECTURE.

By Irving K. POND, President American Institute of Architects.

It is my desire in this slight essay to make a plea for the American expression in Architecture. The experiences of a recent trip in which I touched the Western and Eastern borders of our great country brought home to me more deeply than ever the tremendous possibilities which inhere in American Architecture. This does not mean the development of a monotonous style, but rather the expression of a varied and vital American life. Everywhere, from coast to coast, was clearly evidenced the American spirit. Everywhere was the family resemblance; yet everywhere was evinced that individuality which made the journey from one place to another fruitful and full of interest. And so, as earnestly as may be, I wish to make the plea for individuality and for adherence to local custom and tradition when they are based upon the solid ground of ethnic, climatic and geographical conditions, and for the development of such customs and traditions where the soil is ripe.

In the advance of architectural and social sophistication not all of our cities have lost their individual flavor, and to maintain and emphasize that flavor should be a duty. Here and there architectural trousers are turned up in imitation of the English, and here and there daubs of French cosmetics are smeared upon the façades, but in general the aspect is American and smacks of the region soil And why not? Our sons may for a bit be silly and overdress or underdress their callow parts; our daughters may be the one for a period frivolous, the other for a time over-prudish, but they are at heart clean and strong and American, and to be American means to have breadth of character and outlook.

Under our skies are at the same moment winter blasts and summer flowers; within our borders are broad prairies and inland seas, rugged and snow capped mountains, and mighty rivers, undulating hills and placid lakes; and each locality is inhabited by beings sensitive to the native charm of the region and willing and waiting to echo that charm in architecture if the architect will but help them. But instead of bread, is he not offering a stone? Out of each town, large or small, is he not making, so far as in him lies, a little conventional Paris, or a little New York of a lower type? Why reduce all our would-be and should-be vital sons and daughters to conventional automata? Why not echo the serious note of the mountain when you are building under its crest, and if you are in its fruited and flowered valley, why not echo the spirit of fruit and flower in the forms and colors of the detail? Why not reflect the sun in the façade when you are building under its genial rays, and why not feature the sheltering roof when in the locality storms occur at frequent intervals? Why reduce everything everywhere to the deadly, dull level of copybook architecture? Why cannot the schools and ateliers produce poets and annihilate stranglers of sentiment? What is the architect? Emerson has described him in that great little poem called "Culture." For "semi-god" substitute "architect." For our purpose, the word fills equally the measure and the thought.

"Can rules or tutors educate
"The semi-god whom we await?
"He must be musical,
"Tremulous, impressional;
"Alive to gentle influence
"Of landscape and of sky
"And tender to the spirit touch
"Of man's or maiden's eye,
"But to his native center fast
"Shall into Future fuse the Past
"And the world's flowing fates in his own mould recast."

In these days of conservation, the architects, and above all, the American Institute of Architects, should be the conservators of our national sentiment in architecture, of our national idealism.

There was a movement by those concerned to employ European architects to design after the European manner the great buildings for the coming international Exposition in Japan. The American Institute of Architects and certain art societies considered the propriety of addressing a protest to the government of the Mikado, begging in the interests of art and the eternal fitness of things that the buildings be done by Japanese architects after the manner of their own art. Is not the architectural sentiment of our country as represented by the American Institute of Architects, and are not the art societies equally, concerned with the eternal fitness of things nearer home? "Ah," it is answered, "Japan has a distinctive architecture and America has none." Give America a chance. There are brains and heart and good taste and common sense in America. Give it a chance to break through the Latin shroud and to do the obvious thing in the reasonable manner. Was Japan sensitive and timid before the sophisticated foreigner that she sought European counsel in her Exposition architecture? Are we diffident that we bow to Europe, just at this present time to Paris, in our art? Consider our position—the American architect to-day is like a guest in a friend's house. At even tide the little daughter of the house, wistful, appealing, comes for a sympathetic word and a good-night kiss. The guest, ill at ease, beholds the maiden aunts—who represent the so-

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phisticated attitude of society towards art —hesitates and recites in an impressive manner Marc Antony's oration over the body of Caesar, or if he be sufficiently erudite, quotes Cicero on "Friendship" in the original. The maiden aunts exclaim with one accord, "How beautiful, how artistic," but the child withdraws repulsed and seeks consolation of its mother, who pities the man, and he, poor fool, never knows the pleasure he might have conferred, nor the satisfaction he has missed.

The plea I make is for a distinctive national unity and for variety in that unity. I want to see Boston stay Boston, with its quaint graveyards, its crooked streets, its prim little Puritan ways. I want to see Father Knickerbocker come to himself, lay aside his borrowed toga and eliminate the French shrug which is becoming habitual —the two do not harmonize anyway. I want to see the "City of Brotherly Love" become so architecturally as well as in name. The buildings of the city used to scream at each other and at themselves, but the armies of good taste are at last encamped on the hills—in Germantown, in Mt. Airy, on Chestnut Hill—are gradually investing the city. I want to see the placid waters of Lake Michigan close calmly over the body—over the spirit—of any man who suggests a beaux arts civic center for the City of Chicago, or in any way interferes with a rational, beautiful and American development of the great, strenuous and vital prairie town. I want to see Los Angeles less imitative of Chicago and the East and turn her eyes towards San Francisco, or better, up to her own everlasting hills. I want to see San Francisco develop further the spirit of the coast which now animates her. The fire and the quake threw off the shackles of the past and now in San Francisco there is a definite, though seemingly subconscious, movement to reflect in the mass the grand, serious spirit of the mountains as did the founders of the missions and to detail as did the Orientals in the brilliant, colorful, rich spirit of the valleys.

When the pendulum swings and the tide of artistic empire sets eastward from the Pacific, our American architecture will suffer no loss of distinction and will gain measurably in spirit. With the independent American spirit in control, with the Orient tickling the fancy and the early Spaniards stirring the imagination, what heights in architecture might not be reached by our technically trained craft, could we but feel, could the heart hold equal sway with the brain, and sentiment, as well as knowledge, guide the fingers.

PROTECTIVE COATINGS FOR VARIOUS STRUCTURAL MATERIAL—*Continued.*

on the North Dakota fences were, as a rule, very bad.

The painting of concrete was dwelt upon for some time and a series of exposure tests which had been made were explained. The principles underlying the successful painting of concrete were brought forth. The free lime which is generated upon the setting of concrete is generally the cause of failure of paint upon concrete. The neutralization of this free lime by the use of such chemicals as zinc sulphate in solution and by various soaps and oils was spoken of.

One of the most interesting points in the lecture was the explanation of the various painting tests on iron and steel which are being conducted by the Scientific Section, together with committees "E" and "U" of the American Society for Testing Materials.

The theory of solution pressure, osmotic pressure, theories of electrolytic hydrolysis and electrolysis which have been gone into recently by physical chemists in a careful study of the corrosion and preservation of iron and steel were touched upon. He stated that the rusting of iron was primarily due to attack by hydrogen irons. In order that rust should be formed iron must go into solution and hydrogen must be given off in the presence of oxygen or certain oxidizing agents. This presumes electrolytic action as every iron ion that appears at a certain spot demands the disappearance of a hydrogen ion at another with a consequent formation of gaseous hydrogen. The gaseous hydrogen is rarely visible in a process of rusting, owing to the rather high solubility and great diseffusive power of this element. Substances which increase the concentration of hydrogen ions, such as acids and acid salts, stimulate corrosion while substances which increase the concentration of hydroxyl ions inhibit it. Chromic acid and its salts inhibit corrosion by producing a polarizing effect which prevents the solution of iron and the separation of hydrogen. It has been found that chromates such as chromate of zinc and others, when painted in oil upon steel plates give perfect protection. The use of zinc chromate and other inhibitive pigments in paints for iron and steel shows most excellent results upon the steel plates at Atlantic City.

Some of the best results have been obtained by the use of red lead and litharge, the latter being a pigment which gives in the presence of moisture an excessive high concentration of the so-called hydroxyl ions, which are the ions which inhibit corrosion. The use in the future of litharge as a painting pigment on structural steel will probably be larger than heretofore.

Pigments which excite electrolysis because of galvanic currents they set up when in the presence of steel, are dangerous and often cause early rusting. Careful test should be made by the engineer and the architect upon all paints before using as protective coatings, and if more care is given in the selection of proper protective coatings better results will be obtained.

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MISCELLANEOUS AND USEFUL INFORMATION CONCERNING BUILDING ENGINEERING, TRADES AND MATERIALS.

The following pages contain tables, formulae, and miscellaneous information intended to be of assistance to architects in the preparation of plans, specifications, estimates, and the general supervision of the construction work. In order to make the classification simple and to follow a uniform system this matter is classified according to the Dewey System, see page 311, and the file or classification numbers are printed in small type at the head of each piece of matter falling under a different classification. As far as possible the names of authorities quoted are given but in some cases this has been impossible.

FILE 690.12

RULES AND FORMULAS FOR THE DESIGN OF SIMPLE WOOD BEAMS OR JOISTS.

When a beam is to be designed its length and the loads to which it is to be subjected are known, thus the maximum bending moment may be found.

The **allowable-working-strength** is assumed in accordance with engineering practice and must not be more than allowed by building laws, locally applicable. This **allowable-working-strength** is usually stated in municipal codes as a fixed number of pounds per square inch of cross sectional area, for each kind of material. This might just as well be stated in pounds or any other unit of weight per square foot or any other unit of area, it being only important that whatever unit of dimension is used that the same unit shall be used both for areas, lengths and breadths.

Breadth-of-the-beam times **the-square-of-the-depth** divided by **six** equals **Bending-Moment** divided by **allowable-working-strength** per unit of area corresponding with unit of length used for stating the length and breadth of beam.

Bending-Moment (for beams uniformly loaded) equals **weight-to-be-supported-per-unit-of-length** times **the-square-of-the-total-number-of-units-of-length** divided by **eight.**

For a simple beam loaded with a single weight, the **maximum-Bending-Moment** (which is to be used in formula) equals **the-entire-load** times [(**the-length-of-the-beam**) minus (**the-distance-of-the-load-from-the-left-hand-end**)] times **the-distance-of-the-load-from-the-left-hand-end-of-the-beam** divided by **the-length-of-the-beam.**

If the load be movable **the-distance-of-load-from-left-hand-end** will be variable and the **maximum-moment** will be developed when the load is at the middle where the **maximum-Bending-Moment** is equal to **one-fourth-the-load** times **the-length-of-the-beam.** Placing the entire load on a beam at its center therefore produces the maximum strain that it is possible to produce on such beam by any position of such load.

APPLICATION OF ABOVE PRINCIPLES.

M=maximum bending moment.

S=the tensile or compressive unit stress per square inch allowable by building code or engineering practice for the material selected (See Section 595, Chicago Municipal Code).

l = length in inches of beam between supports.

b = breadth in inches of the beam.

d = depth in inches of the beam.

w = weight in pounds on beam including the weight of the beam itself per each inch of length.

W = total weight in pounds on beam = l w.

FOR UNIFORM LOADING.

$b = \frac{3\ w\ l^2}{4\ d^2\ S} = \frac{3\ W\ l}{4\ d^2\ S}$ = breadth of beam. $\qquad d = \sqrt{\frac{3\ w\ l^2}{4\ b\ S}} = \sqrt{\frac{3\ W\ l}{4\ b\ S}}$ = depth of beam.

To find **b** it is necessary to assume a value for **d.** Also to find **d** it is necessary to assume a value for **b.** In case it is found that the value by formula is too large or too small for practical use, then assumed value must be changed so as to bring the computed value to a practical size.

Weights of Materials.

FILE 691.11

Dry Woods.

	Lbs. Board ft.	Lbs. Cubic ft.		Lbs. Board ft.	Lbs. Cubic ft.
Apple	4.1	49.	Iron Wood	6.	71.
Ash, American white	3.9	47.	Larch	3.	35.
Birch	3.9	45.	Lignum vitæ	6.9	83.
Beech	3.7	43.	Mahogany, Honduras	2.9	35.
Boxwood	5.	60.	Mahogany, Spanish	4.4	53.
Cedar, American	2.9	35.	Maple	4.1	49.
Cedar, W. Indian	3.9	47.	Maple, soft	3.5	42.
Cedar, Lebanon	2.5	30.	Oak, live	4.9	59.3
Cherry	3.5	42.	Oak, red	3.9	45.
Chestnut	3.4	41.	Oak, white	4.3	52.
Cork	1.3	15.	Pine, Southern	3.7	45.
Elm	2.9	35.	Pine, white	2.1	25.
Ebony	6.3	76.1	Pine, yellow	2.8	34.3
Hemlock	2.1	25.	Spruce	2.1	25.
Hickory	4.4	53.	Sycamore	3.1	37.
Hornbeam	2.9	47.	Walnut	3.2	38.

Building Materials Stacked.

	Lbs. Cubic ft.		Lbs. Cubic ft.
Brick, pressed	150	Granite or limestone, rubble work	138
Brick, common	125	Granite or limestone, well dressed	165
Cement, Portland	80 to 100	Limestones and marbles	168
Cement, Rosedale	56	Lime, quick	53
Common brickwork, cement mortar	130	Mortar, hardened	103
Common brickwork, lime mortar	120	Plaster of paris	141.6
Concrete cement	140	Sand	90-106
Earth dry, shaken	82 to 92	Sandstone	151
Earth, rammed	92 to 100	Shales	162
Glass, window	157	Slate	175
Granite	170	Trap rock	187

BUILDING MATERIALS IN CONSTRUCTION.

Roof Covering.

	Lbs. per sq. ft.
Shingles, wood, 16"	2.
Tin and paint	1.
Iron sheet black and paint	1.5
Iron, galvanized	1 to 3.
Iron, corrugated	1 to 3.75
Copper, sheet	.75 to 1.25
Sheet Lead (See File 695)	4 to 8.
Zinc	1 to 2.00
Ready Compo Roofing	1 to 1.50
Felt and gravel	8 to 10.00
States, average (See File 695)	10.00
Tiles, plain, average	12.00
Tiles, fancy, laid in mortar	25 to 30.

Sheathing, Flooring, Etc.

Pine, Hemlock, Spruce, Poplar, Redwood, per inch thick	3.
Chestnut or Maple	4.
Ash, Hickory, L. L. Y. P., Oak	5.
Brick arches, 4" thick & concrete	70.
Porous tiles for slating, without slate	10.
Hollow tiles, 3.75" flat	12.
Hollow tiles, 6" arches	22.
Hollow tiles, 9" arches	36.

Joists and Rafters.

	Lbs. per sq. ft.
White pine, 2"x4", 16" o, c	1.5
Y. P. 2"x4", 16" o, c	2.5
White pine, 2"x6", 16" o, c	2.25
Y. P. 2"x6", 16" o, c	3.75
White pine, 2"x8", 16" o, c	3.00
Y. P. 2"x8", 16" o, c	5.0
White pine, 2"x10", 16" o, c	3.75
Y. P. 2"x10", 16" o, c	6.25

Purlines.

Wood, if supporting rafters 1 to 3
Iron or Steel, if supporting rafters 2 to 4

Ceiling.

Wainscoting or D. M. & B. stuff, same as sheathing.
Lath and plaster, 2 coats 9
Lath and plastering, 3 coats 10
Light book tiles, supported by T-bars without plastering 5

Live Loads.

See building code. Snow load for New York City, Cleveland, Chicago, Des Moines, averages about 20 lbs.

NOTE.—Mr. Winslow was prevented from presenting his work on the application of the new building ordinances on account of their not being adopted at time of going to press. We hope that these can be presented next year.—Editor.

TABLES OF WORKING STRESSES IN ORDINARY STRUCTURAL DESIGN

By BENJAMIN E. WINSLOW, M. W. S. E.

The tables and data given on pages 270, 271, 272 and 273 are extracts from articles published by Mr. Winslow in "The Technograph" and elsewhere.

Ultimate and Safe Strength of Concrete in Pounds Per Square Inch

Modulus of Elasticity of P. C. Stone Concrete 1:2:4—60 Days Old for Various Stresses	Modulus of Elasticity	Strength of 1:2:4 P. C. Stone Concrete for Various Ages	Compression on Top Fibers of Beams			Modulus of Elasticity	
			Ultimate		Safe	Ultimate	
	Ultimate		From	To	Av.	From	To
Initial Mod. of Elasticity....	2,000,000	1 Day Old	200	300	0		
E. for Stress of 400 lbs pr. □	1,700,000	2 " "	400	700	100		
" " " 600 " "	1,600,000	4 " "	600	1000	200	800,000	1,300,000
" " " 800 " "	1,500,000	7 " "	900	1500	375	1,200,000	2,000,000
" " " 1000 " "	1,400,000	1 Month Old.....	1200	2000	500	1,600,000	2,600,000
" " " 1200 " "	1,300,000	2 " "	1400	2300	575	1,800.000	3,000,000
" " " 1400 " "	1,100,000	3 " "	1500	2500	625	2,000,000	3.300,000
" " " 1600 " "	900,000	6 " "	1600	2700	675	2,200,000	3,600,000
" " " 1800 " "	600,000	1 Year Old.....	1700	2900	725	2,300,000	3,800,000
E. for Ultimate Strength....	0	2 " "	1800	3000	750	2,400,000	4,000,000

These tables will cover variations of the material and give the range of strength that could be expected of good ordinary materials and workmanship. Inferior materials will come below the lowest limits given in these tables, and superior materials will come above the highest limits. The safe compressive unit stress to be used for long columns should be obtained from the use of some approved column formulae, which also should take care of possible eccentric applications of the load.

The safe extreme fiber stress for long, narrow beams and girders, including plate girders, not braced sideways, should also be obtained from some approved column formulae. In this manner the lateral strength of beams is provided for.

The following method is believed to conform with good practice for computing loads in buildings:

Figure all parts of the building for the full dead load.

Figure joists and beams for the full live load.

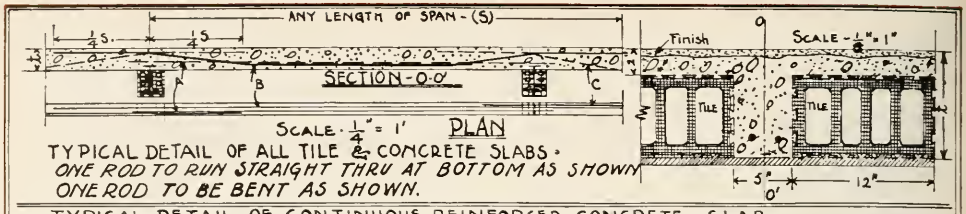
Figure girders for 85 to 90 per cent of the live load.

Figure the columns supporting the roof and top story of a building for the full live load. For each succeeding story below, make a reduction of 5 per cent in the full live load coming on the columns. This reduction must however, not exceed 50 per cent of the full live load for a many storied building.

Figure the foundations for one-third of the full live load.

Ultimate and Safe Strength of Masonry in Pounds Per Square Inch.

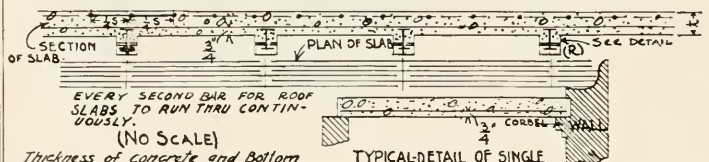
MATERIAL	Compression			Safe Bearing	Modulus of Elasticity		Shear			Tension			Weight per Cubic Foot	
	Ultimate		Safe		Ultimate		Ultimate		Safe	Ultimate		Safe		
	From	To	Av.		From	To	From	To	Av.	From	To	Av.	From	To
Hard Brick Work in P. C.	2000	3000	200	275	1,500,000	2 500,000				100	200	20	130	150
Common " P. C.	1500	2500	175	250	1,500,000	2,500,000	150	300	20	100	200	20	110	130
" " N. C.	1000	2000	150	200	1,000,000	1,500,000				50	100	10	110	130
" " L. M.	800	1600	100	150	500,000	1,000,000				20	40	5	110	130
" " P.C.& L.M.	1000	2000	150	200	1,000,000	1,500,000				50	100	10	110	130
Old Brick Work in P. C.	2000	3000	200	275	2,000,000	3,000,000				120	250	25	110	130
" " " N. C.	1500	2500	175	250	1,500,000	2,000,000				70	120	15	110	130
" " " L. M.	1000	2000	150	200	1,000,000	1,500,000				25	50	7	110	130
Brick Piers in P. C.....	1500	2500	175	250	1,500,000	2,500,000				100	200	20	110	130
" " L. M.....	800	1600	100	150	500,000	1,000,000				20	40	5	110	130
Rubble Work in P. C...	1000	2000	150	200	1,500,000	2,500,000				70	150	20	130	150
Coursed Rubble in P. C..	1500	2500	175	250	2,000,000	3,000,000				100	200	20	140	160
Neat P. C.....	2000	4000	200	300	1,500,000	3,000,000	1200	2400	300	400	800	70	80	90
Neat N. C.....	1000	3000	175	250	1,000,000	2,000,000	700	1500	125	200	400	30	60	70
P. C. Mortar 1 : 3	1500	2500	175	250	1,000,000	2,000,000	200	400	35	200	400	30	120	130
N. C. Mortar 1 : 2	800	1500	150	200	800 000	1.500,000	150	300	25	100	200	20	120	130
Lime Mortar.....	200	400	100	150	500,000	800,000	50	100	10	20	40	5	90	110
P. C. Stone Concrete 1:2:4	1500	3500	400	500	1,500,000	3,500,000	800	1200	125	200	400	40	140	150
N C. " " 1:2:5	1000	2000	200	300	1,000,000	2,000,000	500	1000	80	150	300	25	140	150
P. C. Cinder 1:2:5	800	1600	150	200	500,000	1,000,000	70	120	10	100	150	20	100	110
Granite	12000	20000	400	600	3,000,000	6,000,000	1200	2400	300	1200	2400	200	160	180
Limestone.	6000	12000	350	500	2,000,000	5,000,000	1000	2000	175	1000	2000	175	150	170
Sandstone.....	5000	10000	300	400	1,000,000	3,000,000	800	1600	125	800	1600	125	140	160
Brick and Tile.....	2000	5000	200	300	1,000,000	3,000,000	500	1000	80	500	1000	80	120	140



SCALE - $\frac{1}{4}$" = 1' PLAN

TYPICAL DETAIL OF ALL TILE & CONCRETE SLABS.
ONE ROD TO RUN STRAIGHT THRU AT BOTTOM AS SHOWN
ONE ROD TO BE BENT AS SHOWN.

TYPICAL DETAIL OF CONTINUOUS REINFORCED CONCRETE SLAB.



(No Scale)

Thickness of concrete and Bottom Reinforcement as given in Table.

TYPICAL DETAIL OF SINGLE SPANS OF REINFORCED CONCRETE SLABS.

Top reinforcement (RODS) to be of same Section as those at Bottom. - SPACE TOP BARS TWICE BOTTOM BAR SPACING. TOP BARS TO PROJECT one-fourth the span beyond the support. CROSS RODS AT RIGHT ANGLES TO MAIN CARRYING RODS WILL BE $\frac{3}{8}$" PLACED 18" ON CENTERS. Ends of bars should be bent to form a small hook and entirely covered with at least $\frac{3}{4}$" Concrete

REINFORCED COMBINATION CONCRETE - TILE FLOOR SLABS - 100-LBS. LIVE LOAD.

SPAN	CONTINUOUS BEAMS			SIMPLY SUPPORTED BEAM		
S	TILE	CONCRETE	RODS	TILE	CONCRETE	RODS.
16'-0"	7"	2"	2 - $\frac{5}{8}$"-□	7"	2	2 - $\frac{5}{8}$"-□
15'-0"	7"	2"	2 - $\frac{5}{8}$"-□	7"	2	2 - $\frac{5}{8}$"-□
14'-0"	6"	2"	2 - $\frac{1}{2}$"-□	7"	2	2 - $\frac{5}{8}$"-□
13'-0"	5"	2"	2 - $\frac{1}{2}$"-□	7"	2	2 - $\frac{5}{8}$"-□
12'-0"	4"	2"	2 - $\frac{1}{2}$"-□	6"	2	2 - $\frac{1}{2}$"-□
11'-0"	4"	2"	2 - $\frac{1}{2}$"-□	5"	2	2 - $\frac{1}{2}$"-□
10'-0"	4"	2"	2 - $\frac{1}{2}$"-□	4"	2	2 - $\frac{1}{2}$"-□
9'-0"	4"	2"	2 - $\frac{1}{2}$"-□	4"	2	2 - $\frac{1}{2}$"-□
8'-0"	4"	2"	2 - $\frac{1}{2}$"-□	4"	2	2 - $\frac{1}{2}$"-□
7'-0"	3"	2"	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□
6'-0"	3"	2"	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□
5'-0"	3"	2"	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□
4'-0" AND LESS	3"	2"	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□

REINFORCED COMBINATION CONCRETE TILE ROOF SLABS - 25 LBS. LIVE LOAD.

16'-0"	4"	2	2 - $\frac{1}{2}$"-□	5"	2	2 - $\frac{1}{2}$"-□
15'-0"	4"	2	2 - $\frac{1}{2}$"-□	5"	2	2 - $\frac{1}{2}$"-□
14'-0"	4"	2	2 - $\frac{1}{2}$"-□	5"	2	2 - $\frac{1}{2}$"-□
13'-0"	4"	2	2 - $\frac{1}{2}$"-□	4"	2	2 - $\frac{1}{2}$"-□
12'-0"	4"	2	2 - $\frac{1}{2}$"-□	4"	2	2 - $\frac{1}{2}$"-□
11'-0"	3"	2	2 - $\frac{3}{8}$"-□	4"	2	2 - $\frac{1}{2}$"-□
10'-0"	3"	2	2 - $\frac{3}{8}$"-□	4"	2	2 - $\frac{1}{2}$"-□
9'-0"	3"	2	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□
8'-0"	3"	2	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□
7'-0" AND LESS	3"	2	2 - $\frac{3}{8}$"-□	3"	2	2 - $\frac{3}{8}$"-□

REINFORCED CONCRETE SLABS FOR FLOORS - 100 LBS. LIVE LOAD

SPAN	CONTINUOUS SLABS MADE IN PLACE			SIMPLY SUPPORTED SLABS. MADE IN PLACE			READY-MADE CONCRETE-I-B				
S	THICKNESS	SIZE OF BAR	SPACING	THICKNESS	SIZE OF BARS	SPACING	DEPTH	WIDTH	NO. OF BARS IN BOTTOM	NO. OF BARS IN TOP	SIZE OF BARS
16'-0"	7"	$\frac{1}{2}$"	5"	8"	$\frac{1}{2}$"	4"					
15'-0"	6$\frac{1}{2}$"	$\frac{1}{2}$"	5$\frac{1}{2}$"	8"	$\frac{1}{2}$"	5"					
14'-0"	6"	$\frac{1}{2}$"	6"	7$\frac{1}{2}$"	$\frac{1}{2}$"	5"					
13'-0"	6"	$\frac{1}{2}$"	6$\frac{1}{4}$"	7"	$\frac{1}{2}$"	5$\frac{1}{4}$"	7"	10"	2	1	$\frac{9}{16}$"
12'-0"	5$\frac{1}{2}$"	$\frac{1}{2}$"	6$\frac{1}{2}$"	6$\frac{1}{2}$"	$\frac{1}{2}$"	5$\frac{1}{2}$"	7"	10"	2	1	$\frac{1}{2}$"
11'-0"	5$\frac{1}{2}$"	$\frac{1}{2}$"	6$\frac{3}{4}$"	6"	$\frac{1}{2}$"	6"	7"	10"	2	1	$\frac{7}{16}$"
10'-0"	4$\frac{1}{2}$"	$\frac{3}{8}$"	4$\frac{1}{2}$"	5$\frac{1}{2}$"	$\frac{1}{2}$"	6$\frac{1}{2}$"	6"	10"	2	1	$\frac{7}{16}$"
9'-0"	4"	$\frac{3}{8}$"	5$\frac{1}{2}$"	5"	$\frac{3}{8}$"	4"	6"	10"	2	1	$\frac{3}{8}$"
8'-0"	3$\frac{1}{2}$"	$\frac{3}{8}$"	6$\frac{1}{4}$"	4$\frac{1}{2}$"	$\frac{3}{8}$"	4$\frac{1}{2}$"	5"	9"	2	1	$\frac{3}{8}$"
7'-0"	3$\frac{1}{2}$"	$\frac{3}{8}$"	6$\frac{1}{2}$"	4"	$\frac{3}{8}$"	5$\frac{1}{2}$"	5"	9"	2	1	$\frac{3}{8}$"
6'-0"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	3$\frac{1}{2}$"	$\frac{3}{8}$"	6$\frac{1}{2}$"	4"	8"	2	1	$\frac{3}{8}$"
5'-0"	2$\frac{1}{2}$"	$\frac{1}{4}$"	4$\frac{1}{2}$"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	4"	8"	2	1	$\frac{5}{16}$"
4'-0"	2$\frac{1}{2}$"	$\frac{1}{4}$"	4$\frac{1}{2}$"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	4"	8"	2	1	$\frac{5}{16}$"
3'-0" AND LESS	2$\frac{1}{2}$"	$\frac{1}{4}$"	5"	2"	$\frac{1}{4}$"	4"	3$\frac{1}{2}$"	8"	2	0	$\frac{1}{4}$"

REINFORCED CONCRETE SLABS - FOR ROOF - 25 LB. LIVE LOAD

14'-0"	4$\frac{1}{2}$"	$\frac{3}{8}$"	4$\frac{1}{2}$"	5$\frac{1}{2}$"	$\frac{1}{2}$"	6$\frac{1}{2}$"	6"	10"	2	1	$\frac{7}{16}$"
13'-0"	4"	$\frac{3}{8}$"	5$\frac{1}{2}$"	5"	$\frac{3}{8}$"	4"	6"	10"	2	1	$\frac{7}{16}$"
12'-0"	4"	$\frac{3}{8}$"	5$\frac{1}{2}$"	4$\frac{1}{2}$"	$\frac{3}{8}$"	4$\frac{1}{2}$"	6"	9"	2	1	$\frac{3}{8}$"
11'-0"	3$\frac{1}{2}$"	$\frac{3}{8}$"	6"	4$\frac{1}{2}$"	$\frac{3}{8}$"	4$\frac{1}{2}$"	5"	9"	2	1	$\frac{3}{8}$"
10'-0"	3$\frac{1}{2}$"	$\frac{3}{8}$"	6$\frac{1}{2}$"	4'	$\frac{3}{8}$"	5$\frac{1}{2}$"	4"	8"	2	1	$\frac{3}{8}$"
9'-0"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	3$\frac{1}{2}$"	$\frac{3}{8}$"	6$\frac{1}{2}$"	4"	8"	2	1	$\frac{3}{8}$"
8'-0"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	4"	8"	2	1	$\frac{5}{16}$"
7'-0"	2$\frac{1}{2}$"	$\frac{1}{4}$"	4$\frac{1}{2}$"	3"	$\frac{1}{4}$"	3$\frac{1}{2}$"	4"	8"			
6'-0"	2$\frac{1}{2}$"	$\frac{1}{4}$"	6"	2$\frac{1}{2}$"	$\frac{1}{4}$"	4$\frac{1}{2}$"					

BY BENJAMIN E. WINSLOW, M.W.S.E.

Ultimate and Safe Strength of Wood in Pounds Per Square Inch

MATERIAL	Extreme Fiber Stresses			Compression with the Grain			Compression Across the Grain			Modulus of Elasticity		Weight per Cubic Foot	
	Ultimate		Safe	Ultimate		Safe	Ultimate		Safe	Ultimate			
	From	To	Av.	From	To	Av.	From	To	Av.	From	To	From	To
Long Leaf Pine	7000	14000	1500	6000	9000	1500	1000	2000	350	1,500,000	2,250,000	40	50
Oregon Pine	7000	13000	1400	6000	9000	1400	900	1800	300	1,400,000	2,100,000	35	45
White Oak	6000	12000	1300	5000	8000	1300	1500	3000	500	1,300,000	1,950,000	45	55
Short Leaf Pine	6000	11000	1200	5000	8000	1200	900	1800	300	1,200,000	1,800,000	35	45
Spruce	5000	10000	1100	4000	7000	1100	800	1600	250	1,100,000	1,650,000	30	40
Norway Pine	5000	9000	1000	4000	6000	1000	700	1400	200	1,000,000	1,500,000	30	40
White Pine	4000	8000	900	4000	6000	900	600	1200	200	900,000	1,350,000	25	30
Fir	4000	7000	800	3000	5000	800	600	1200	200	800,000	1,200,000	25	30
Hemlock	3000	6000	700	3000	4000	700	600	1200	200	700,000	1,050,000	25	30
Cedar	3000	5000	600	3000	4000	600	500	1000	200	600,000	900,000	20	25

MATERIAL	Shear with the Grain			Shear Across the Grain			Tension with the Grain			Elastic Limit		Modulus of Resilience
	Ultimate		Safe	Ultimate		Safe	Ultimate		Safe	Ultimate		
	From	To	Av.	From	To	Av.	From	To	Av.	From	To	
Long Leaf Pine	400	800	150	4000	6000	1000	8000	15000	1700	6000	12000	3.0
Oregon Pine	400	700	140	4000	5000	900	8000	14000	1600	6000	11000	3.0
White Oak	400	1000	200	4000	6000	900	7000	14000	1500	5000	11000	3.0
Short Leaf Pine	350	700	120	3000	5000	800	7000	13000	1400	5000	10000	2.5
Spruce	300	600	110	3000	4000	800	6000	12000	1300	4000	9000	2.5
Norway Pine	300	600	100	3000	4000	700	6000	11000	1200	4000	8000	2.5
White Pine	300	600	90	2000	3500	600	5000	10000	1100	3500	7000	2.0
Fir	250	500	80	2000	3000	500	5000	10000	1000	3000	6000	2.0
Hemlock	200	400	70	2000	3000	500	4000	9000	900	2500	5000	2.0
Cedar	200	400	60	2000	2500	400	4000	8000	800	2500	4500	1.5

SQUARE MEASURE.

144 square inches = 1 square foot.
9 square feet = 1 square yard.
272¼ feet = 1 square rod or pole.
40 rods = 1 square rood.
4 roods
160 rods
4,840 yards.
43,560 feet
10 square chains
= 1 acre.
640 acres = 1 square mile.

2,471 acres = 1 hectare.
7,840 square yards = 1 Irish acre.
6150 square yards = 1 Scotch acre.
30 square acres = 1 yard of land.
100 acres = 1 hide of land.
40 hides = 1 barony.
36 sq. miles = 1 township.
640 acres = 1 section.
About 14 25x125 ft. lots = 1 acre.

SOLID OR CUBIC MEASURE.

1728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.
40 cubic feet of rough or 50 cubic feet of hewn timber = 1 ton or load.

108 cubic feet = 1 stack of wood.
128 cubic feet = 1 cord of wood.
40 c. ft. = 1 U. S. A. shipping ton.
42 c. ft. = 1 British shipping ton.

AVOIRDUPOIS WEIGHT.

16 drachms = 1 ounce.
16 ounces = 1 pound.
28 pounds = 1 quarter.

112 pounds = 1 cwt.
20 cwt. = 1 ton.

TROY WEIGHT.

24 grains = 1 dwt.
20 dwt. = 1 oz.

12 oz. = 1 lb.

SIZES OF PAPER (Whatman's).

	Inches.		Inches.
Emperor	72 x 48	Royal	24 x 19
Antiquarian	53 x 31	Medium	22 x 17½
Double elephant	40 x 26¾	Demy	20 x 15½
Atlas	34 x 26	Large post	20¾ x 16¾
Colombier	34½ x 23½	Post	19 x 15¼
Imperial	30 x 22	Foolscap	17 x 13½
Elephant	28 x 23	Post	15 x 12½
Super royal	27 x 19	Copy	20 x 16

Water.

1 cubic foot of water equals 62.5 pounds, or 7.48 U. S. gallons.
1 cubic inch of water equals .036 pounds.
1 cubic foot of water equals 6.2355 Imp. gallons or 7.48 U. S. gallons.
1 cylindrical foot of water equals 49.1 pounds or 5.89 U. S. gallons.
1 U. S. gallon of water equals 8.34 pounds.
1 U. S. gallon of water equals 231 cubic inches.
1 pound pressure per square inch is equivalent to a head of water of 2.3093 feet 1 pound—27.71 inches; 14.7 pounds or 1 atmosphere—33.947 feet, or 10.347 metres; 0.433 pound or 1 atmosphere—1 foot; 43.3 pounds—100 feet.

Gauges and Their Equivalents.

No. 27,	equal to	1/64	inch.
" 21,	" "	1/32	"
" 18,	" "	3/64	"
" 16,	" "	1/16	"
" 14,	" "	5/64	"
" 13,	" "	3/32	"

No. 12,	equal to	7/64	inch.
" 10,	" "	1/8	"
" 8,	" "	11/64	"
" 6,	" "	3/16	"
" 5,	" "	7/32	"
" 4,	" "	1/4	"

Metric Tables.

	Approximate. Equivalent		Accurate. Equivalent
1 inch [length]..	2½	cubic centimeters	2.539
1 centimeter	0.4	inch	0.393
1 yard	1	meter	0.914
1 meter (39.37 inches).....	1	yard	1.093
1 foot	30	centimeters	30.479
1 kilometer (1,000 meters).....	⅝	mile	0.621
1 mile	1½	kilometers	1.600
1 gramme[weight]..	15½	grains	15.432
1 grain.....	0.064	gramme	0.064
1 kilogramme (1,000 grammes).....	2.2	pounds avoirdupois.....	2.204
1 pound avoirdupois	½	kilogramme	0.453
1 ounce avoirdupois (437½ grains).....	28⅓	grammes	28.349
1 ounce troy, or apothecary (480 grains)..	31	grammes	31.103
1 cubic centimeter[bulk]..	1.06	cubic inch	1.060
1 cubic inch.....	16⅓	cubic centimeters	16.386
1 liter (1,000 cubic centimeters).....	1	U. S. standard quart.....	0.946
1 United States quart.....	1	liter	1.057
1 fluid ounce.....	29½	cubic centimeters	29.570
1 hectare (10,000 square meters) [surface]	2½	acres	2.471
1 acre	0.4	hectare	0.40

In the nickel five-cent piece of our coinage is a key to the tables of linear measures and weights. The diameter of this coin is two centimeters, and its weight is five grammes. Five of them placed in a row will give the length of the decimeter, and two of them will weigh a decagram. As the kiloliter is a cubic meter, the key to the measure of length is also the key to the measure of capacity.

Handy Table.

Diameter of a circle × 3.1416 = circumference.
Radius of a circle × 6.283185 = circumference.
Square of the diameter of a circle × 0.7854 = area.
Square of the circumference of a circle × 0.07958 = area.
Half the circumference of a circle × half its diameter = area.
Circumference of a circle × 0.159155 = radius.
Square root of the area of a circle + 0.56419 = radius.
Circumference of a circle × 0.31831 = diameter.
Square root ot the area of a circle × 1.12838 = diameter.
Diameter of a circle × 0.86 = side of inscribed equilateral triangle.
Diameter of a circle × 0.7071 = side of an inscribed square.
Circumference of a circle + 0.225 = side of an inscribed square.
Circumference of a circle × 0.282 = side of an equal square.
Diameter of a circle × 0.8862 = side of an equal square.
Base of a triangle × ½ the altitude = area.
Multiplying both diameters and .7854 together = area of an ellipse.
Surface of a sphere × ⅙ of its diameter = solidity.
Circumference of a sphere × its diameter = surface.
Square of the diameter of a sphere × 3.1416 = surface.
Square of the circumference of a sphere × 0.3183 = surface.
Cube of the diameter of a sphere × 0.5236 = solidity.
Cube of the radius of a sphere × 4.1888 = solidity.
Cube of the circumference of a sphere × 0.016887 = solidity.
Square root of the surface of a sphere × 0.56419 = diameter.
Square root of the surface of a sphere + 1.772454 = circumference.
Cube root of the solidity of a sphere × 1.2407 = diameter.
Cube root of the solidity of a sphere × 3.8978 = circumference.
Radius of a sphere × 1.1547 = side of inscribed cube.

Square root of ($\frac{1}{8}$ of the square of) the diameter of a sphere = side of inscribed cube.
Area of its base × $\frac{1}{3}$ of its altitude = solidity of a cone or pyramid, whether round, square, or triangular.
Area of one of its sides × 6 = surface of a cube.
Altitude of trapezoid × $\frac{1}{2}$ the sum of its parallel sides = area.

TABLE OF SQUARE ROOTS.

No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root.	No.	Sq. Root
25	5.	650	25.46	1400	37.42	2600	50.99
50	7.071	700	26.46	1450	38.08	2700	51.96
75	8.66	750	27.39	1500	38.73	2800	52.91
100	10.00	800	28.28	1550	39.37	2900	53.85
125	11.18	850	29.15	1600	40.00	3000	54.77
150	12.25	900	30.00	1650	40.62	3200	56.57
175	13.23	950	30.82	1700	41.23	3400	58.30
200	14.14	1000	31.62	1800	42.43	3600	60.00
250	15.81	1050	32.40	1900	43.59	3800	61.64
300	17.32	1100	33.16	2000	44.72	4000	63.24
350	18.70	1150	33.91	2100	45.82	4200	64.80
400	20.00	1200	34.64	2200	46.90	4400	66.32
450	21.21	1250	35.36	2300	47.95	4600	67.82
500	22.36	1300	36.06	2400	48.99	4800	69.28
550	23.45	1350	36.74	2500	50.00	5000	70.72
600	24.49						

Dimensions of a Barrel.—Diameter of head, 17 inches; bung, 19 inches; length, 28 inches; volume, 7,680 cubic inches.

Expansion of Water (Dalton).

Temperature.	Expansion.	Temperature.	Expansion.	Temperature.	Expansion.
22°	1.0009	72°	1.0018	152°	1.01934
32	1	92	1.00477	172	1.02575
*46	1	112	1.0088	192	1.03265
52	1.00021	137	1.01367	212	1.0466

*Greatest density at 39.1° Fahr.

A box 24 inches long by 16 inches wide and 28 inches deep will contain a barrel, or three bushels; 24 by 16 inches and 14 inches deep contains half a barrel; 16 inches square and $8\frac{2}{5}$ inches deep will contain one bushel; 16 by $8\frac{2}{5}$ inches and 8 inches deep will contain half a bushel; 8 by $8\frac{2}{5}$ inches and 8 inches deep will contain one peck; 8 inches square and $4\frac{1}{5}$ inches deep will contain one gallon; 7 by 4 inches and $4\frac{4}{5}$ inches deep will contain half a gallon; 4 inches square and $4\frac{1}{5}$ inches deep will contain one quart; 4 feet long, 3 feet 5 inches wide and 2 feet 8 inches deep will contain one ton of coal, or 36 cubic feet.

Table Showing the Pressure of Water at Different Elevations.

Feet Head	Equals Pressure per Square Inch.	Feet Head.	Equals Pressure per Square Inch	Feet Head.	Equals Pressure per Square Inch	Feet Head	Equals Pressure per Square Inch.	Feet Head	Equals Pressure per Square Inch	Feet Head	Equals Pressure per Square Inch
1	.43	65	28.15	130	56.31	195	84.47	260	112.62	350	151.61
5	2.16	70	30.32	135	58.48	200	86.63	265	114.79	360	155.94
10	4.33	75	32.48	140	60.64	205	88.80	270	116.96	370	160.27
15	6.49	80	34.65	145	62.81	210	90.96	275	119.12	380	164.61
20	8.66	85	36.82	150	64.97	215	93.14	280	121.29	390	168.94
25	10.82	90	38.98	155	67.14	220	95.30	285	123.45	400	173.27
30	12.99	95	41.15	160	69.31	225	97.49	290	125.62	500	216.58
35	15.16	100	43.31	165	71.47	230	99.63	295	127.78	600	259.90
40	17.32	105	45.48	170	73.64	235	101.79	300	129.95	700	303.22
45	19.49	110	47.64	175	75.80	240	103.96	310	134.28	800	346.54
50	21.65	115	49.81	180	77.97	245	106.13	320	138.62	900	389.86
55	23.82	120	51.98	185	80.14	250	108.29	330	142.95	1.000	433.18
60	25.99	125	54.15	190	82.30	255	110.46	340	147.28	. . .	. . .

Results of tests by Prof. Thomas Wilson to ascertain the amount of light passing through or obstructed by glass.

FILE 691.6

	Percentage of Light.	
	Admitted.	Obstructed.
American Crystal, ground one side	50.00	50.00
Clear Plate	87.50	12.50
American Crystal, clear, double thick	87.50	12.50
American Crystal, clear, single thick	87.50	12.50
Plate, ground one side	50.00	50.00
Plate, ground two sides	37.50	62.50
American Crystal, ground two sides	37 50	62.50
Hammered ¼ inch thick	87.50	12.50
Ribbed ¼ inch thick	75.00	25.00

FILE 691.8

Solders.

	Copper.	Tin.	Lead.	Zinc.	Silver.	Bismuth	Gold.	Cadmium.	Antimony.
Tin		25	75						
Tin		58	16			16			10
Tin, coarse, melts at 500°		33	67						
Tin, ordinary, melts at 360°		67	33						
Spelter, soft	50			50					
Spelter, hard	65			35					
Lead		33	67						
Steel	13			5	82				
Brass or Copper	50			50					
Fine Brass	47			47	6				
Pewterer's, or soft		33	45			22			
Pewterer's, or soft		50	25			25			
Plumber's pot metal		33	67						
" " coarse		25	75						
" " fine		67	33						
" " fusible		50	50						
" " very fusible		25	25			50			
Gold	4				7		89		
Gold, hard	66			34					
Gold, soft		66	34						
Silver, hard	20				80				
Silver, soft	12				67			21	
Pewter		40	20			40			
Iron	66			33					1
Copper	53	47							

Weight per Square Foot of Sheet Lead.

1/32 inch thick	2 lbs.	1/10 inch thick	7 lbs.
3/64 " "	2½ "	1/9 " "	8 "
1/25 " "	3 "	1/8 " "	10 "
1/16 " "	4 "	3/32 " "	12 "
1/14 " "	5 "	1/6 " "	14 "
1/12 " "	6 "	1/4 " "	16 "

Limes and Cements.—Natural limes and cements are produced by calcining limestones and other calcareous materials, in which process the carbonic acid and moisture they contain are driven off.

Hydraulic Limes are calcined from stone containing 73 to 92 per cent. of carbonate of lime, and a portion of clay, also soluble silica, carbonate of magnesia, alkalies, metallic oxides, and sulphates.

Cements.—There is no precise line between hydraulic limes and cements, the latter containing a larger proportion of clay than limes.

Natural Cements are calcined from stones containing carbonate of lime, a mixture of carbonate of lime and magnesia, together with a proportion of from 30 to 50 per cent. of clay. More than 40 per cent. of clay is injurious to the cements.

Hydraulic Cements are artificial cements made in a similar manner to hydraulic lime, but with a larger proportion of clay, silica, alumina, magnesia, etc. They do not slack after calcination, and some set under water at a temperature of 65 degrees in from 3 to 5 minutes and others in as many hours.

Portland Cement is an artificial cement. Good cement should be ground very fine, and should weigh from 95 to 130 pounds to the striked bushel. Slow setting cement is strongest. It is very important that sand used with cement be perfectly clean and sharp.

Mortar is lime and sand mixed with water. The setting process is a chemical change, the lime and the carbonic acid in the air combining to form a carbonate of lime, which as a cementing element encloses and binds together the particles of sand. The sand should be perfectly free from clay, loam or other impurities, or substitutes for sand may be used in the shape of well burnt clay, coriae from iron-works, slag from furnaces and cinders from coals.

Gypsum, or hydrated sulphate of lime is the basis of most plasters. It is a soft stone, which is either simply calcined, or calcined and combined with salts and alkalies.

Plaster of Paris is gypsum gently calcined till nearly the whole of the moisture is driven off. It can be cast in almost any form in wax or guttapercha moulds. It is also used with other plasters to quicken the setting.

Keene's Cement is plaster of paris soaked in a solution of alum and recalcined.

Parian Cement is gypsum calcined and powdered and mixed with a solution of borax, recalcined, ground, and mixed with a solution of alum.

Coarse Stuff is lime water mixed with hair or fiber.

Fine Stuff is lime slaked to a paste run to the consistency of cream, and allowed to harden to the required consistency for working by evaporation.

Gauged Stuff is plaster of paris added in the proportion of about 1 to 4 for its more rapid setting.

Rough Cast is washed gravels mixed with hot hydraulic lime; it is thrown with large trowels in a semi-fluid state upon an even surface of coarse stuff, and colored with lime wash and ochre.

Depeter is a "pricked up" coat of coarse stuff, into which small stone are pressed while in a wet state.

Depretor is plaster finished with a surface similar to cooled stone.

Pugging is coarse stuff put between floors for the purpose of deafening.

Papier Mache is paper reduced to a pulp or sheets of paper glued together and pressed in a metal mould to a required form.

Carton Pierre is similar to papier mache, but made with paper pulp, whiting and size, pressed into plaster moulds.

Fibrous Plaster is plaster of Paris in a thin coat laid on canvas strained on framework.

Some of the Physical Properties of Metals—Compiled from the Best Authorities.

Common Name.	Chemical Name.	Initial.	Atomic Weight.	Specific Gravity.	Weight Cubic inch.	Weight Cubic foot.	Melting Point F.	Specific Heat.	Conductivity of Heat.	Conductivity of Electricity.	Expansion 32 to 212° F.	Hardness, the Diamond.=3010.	Density.	Ductility, Gold being 1.	Malleability, Gold being 1.	Approximate price per lb. avoirdupois.
Hydrogen	Same	H.	1.													
Aluminum	Same	Al.	27.3	2.55	.0924	159.005	1160	.214	31.33			821				$ 16.30
Antimony	Stibium	Sb.	122.0	6.71	.242	418.402	842	.0508	4.03	4.6						0.36
Bismuth	Same	Bi.	207.5	9.823	.354	612.513	510	.0308	1.8	1.1	.004		10.035			1.95
Cadmium	Same	Cd.	111.6	8.60	.31	536.253	500	.0567	20.06		.0094	760	8.217			3.26
Copper	Cuprum	Cu.	63.3	8.82	.318	549.971	1930	.093	74.8	94.1	.0051	1360		6	3	0.22
Gold	Aurum	Au.	196.2	19.32	.697	1224.699	1915	.0324	54.8	73.0		979		1	1	299.72
Indium	Same	Ir.	196.7	22.42	.809	1392.999	4500	.0326				984				466.59
Iron	Ferrum	Fe.	55.9	7.8	.281	486.369	3000	.1138	10.1	15.5	.0035	1375		4	8	0.015
Lead	Plumbum	Pb.	206.4	11.37	.410	708.976	625	.0314	7 9	7.6	.0084	570	10.370	9	6	0.06
Magnesium	Same	Mg.	23.94	1.74	.628	89.791	1200	.25	34.3		.0083	726				45.30
Manganese	Same.	Mn.	58.8	8.0	.289	498.84	3420	.122				1456				108.72
Mercury	Hydrargyrum.	Hg.	199.8	13.58	.490	846.781	39	.0317	1.3		.0182	0				1.00
Nickel	Same	Ni.	58.6	8.80	.318	551.842	3000	.109		13.1	.0038	1410		5	9	5.80
Platinum	Same	Pt.	196.7	21.50	.777	155.887	3200	.0324	9.4	16.6	.0027	1107		3	5	122.31
Potassium	Kalium	K.	39.04	.875	.0316	54.561	110	.166				230				22.65
Silver	Argentum	Ag.	107.66	10.53	.38	656.598	1750	.056	100.00	100.0	.0056	990		2	2	18.60
Sodium	Natrium	Na.	23.0	.9735	.035	60.503	170	.293	36.5			400				3.26
Steel				7.854	.283	489.736	2550	.1165	11.6	12.0						0.025
Tin	Stannum	Sn.	117.8	7.293	.263	454.754	440	.055	15.4	11.4	.0069	651	7.025	8	4	0.25
Zinc	Same	Zn.	64.9	7.14	.258	444.215	780	.096	36.0	29 0	.0088	1077	6.480	7	7	0.10

Law of Specific Heat—In order to raise the temperature of different bodies the same number of thermometric degrees very different amounts of heat are required. The atoms of the solid element possess sensibly the same specific heat.

Ductility—The property of being drawn into wire or threads.

Malleability—The capacity of being extended in all directions by beating with the hammer.

PLANS, SPECIFICATIONS AND ESTIMATES.

NOMENCLATURE OF DRAWINGS.

FILE 692

In response to a request sent out to a large number of prominent architects to send in copies of nomenclature used on their drawings, it was found that this varied with practically every architect, the result being that contractors estimating in different offices are compelled to memorize a large number of different systems of notation before being able to read plans intelligently; same rule applies to draughtsmen going from one office to another, all of which causes much waste of time and greatly increases the possibility of error. With this as an excuse we offer the following series of symbols, selected from the various systems with the hope that it will be generally adopted and thus bring about a greater uniformity of drawing nomenclature. The lighting symbols are taken from the standard symbols for wiring plans, prepared by the National Electrical Contractors Association of the United States. The structural iron symbols are taken from the Osborne system of nomenclature most generally used by structural iron contractors. General symbols are collated from various sources.

· GENERAL SYMBOLS ·

G 8"x10" — GIRDER; NUMERALS INDICATES SIZE, ENCLOSED NUMERAL IND. PARTICULAR GIRDER

7 (SIZE HERE) — COLUMN; SMALL NUMERAL INDICATES NUMBER OF PARTICULAR COLUMN

25 — DOOR; SMALL NUMERAL INDICATES NUMBER OF PARTICULAR DOOR

50 W — WINDOW, SMALL NUMERAL INDICATES NUMBER OF PARTICULAR WINDOW

N 3 — INDICATES DESIGNATING NUMBER OF ROOM

+7'-6" — ELEVATION OF POINT SMALL NUMERALS INDICATE DISTANCE ABOVE ZERO POINT IF PRECEDED BY — REFERS TO POINT BELOW ZERO.

BRICK.

CONCRETE.

WALLS WITH WOOD FURRING & LATH & PLASTER.

" " METAL " " " " "

" " TILE " & PLASTER.

HOLLOW TILE CONSTRUCTION

WALL OF WOOD STUDS & LATH & PLASTER.

STONE.

RUBBLE.

Rs — RUBBLE STONE.

D — DIMENSION STONE.

A — ASHLAR STONE.

Ad — DRESSED ASHLAR.

As — ROCK FACED ASHLAR.

d — ANY STONE DRESSED.

? — NOT DESCRIBED SMALL NUMERALS REFER TO DETAILS & SPECIFICATIONS

STORM SEWER.

DRAINAGE SYSTEM.

SANITARY SEWER.

· LIGHTING SYMBOLS ·

4 — CEILING OUTLET · ELECTRIC ONLY. NUMERAL IN CENTER INDICATES NO. OF STANDARD 16 C.P. INCAND. LAMPS.

4½ — CEILING OUTLET COMBINATION. ½ INDICATES 4-16 C.P. INCANDESCENT LAMPS & 2 GAS BURNERS

2 — BRACKET OUTLET. ELECTRIC ONLY. NUMERAL INDICATES NO. OF STANDARD 16 C.P. INCAND. LAMPS.

4½ — BRACKET OUTLET · COMBINATION. ½ INDICATES 4-16 C.P. INCANDESCENT LAMPS & 2 GAS BURNERS

2 — WALL OR BASE BOARD RECEPTACLE OUTLET. NUMERAL IN C. INDICATES NO. OF ST'D 16 C.P. INCAND. LAMPS.

4 — FLOOR OUTLET. NUMERAL IN C. INDICATES NO. OF ST'D 16 C.P. INCAND. LAMPS

BELL OUTLET

ARC LAMP OUTLET

BUZZER OUTLET

CEILING FAN OUTLET

SPECIAL OUTLET, FOR LIGHTING, HEATING & POWER CURRENT AS DESCRIBED IN SPECIFICATIONS.

TELEPHONE OUTLET · PRIVATE SERVICE

" " · PUBLIC SERVICE

SPEAKING TUBE

DOOR OPENER

4 — CEILING OUTLET, GAS ONLY. NUMERAL INDICATES NO. OF GAS BURNERS

2 — BRACKET OUTLET " " " " " "

F — OUTLET FOR FUEL GAS

· SYMBOLS FOR HEATING PLANS ·

5 — SMALL NUMERAL DESIGNATES PARTICULAR RISER ARROW LOCATES SAME & INCH FIGURE GIVES SIZE.

12 — SMALL NUMERAL DESIGNATES PARTICULAR RADIATOR

6" — SMALL NUMERAL IN INCHES GIVES SIZE AND ARROW LOCATES FEED

3" — " " " " " "

" " " RETURN

INDICATES DIRECTION OF FLOW

" " " FOUL AIR

H A — HOT AIR

14 — 12"x14" — ENCLOSED NUMERAL INDICATES PARTICULAR REGISTER, INCHES INDICATE SIZE

5 — 12" — SMALL NUMERAL INDICATES NO OF LEADER, INCHES INDICATE INTERIOR DIAMETER, ARROW INDICATES DIRECTION OF FLOW

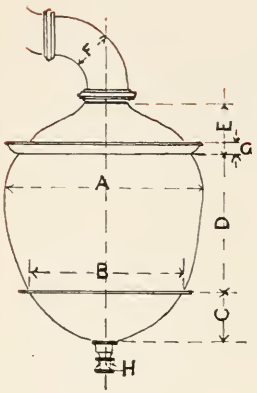
3½"x13½" — 7 — SMALL NUMERAL INDICATES NO OF PARTICULAR STACK, INCHES INDICATE SIZE

TABLE OF TREADS AND RISES.

No. of Treads.	6		6¼		6½		6¾		7		7⅛		7¼		7⅜		7½		7⅝		7¾		7⅞		8		8¼		8½		9		9½		10		10½		11		13		14	
	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.	Inch ft.	Rise. in.
1		6		6¼		6½		6¾		7		7⅛		7¼		7⅜		7½		7⅝		7¾		7⅞		8		8¼		8½		9		9½		10		10½		11	1	1	1	2
2	1	0	1	0½	1	1	1	1½	1	2	1	2¼	1	2½	1	2¾	1	3	1	3¼	1	3½	1	3¾	1	4	1	4½	1	5	1	6	1	7	1	8	1	9	1	10	2	2	2	4
	1	6	1	6¾	1	7½	1	8¼	1	9	1	9⅜	1	9¾	1	10⅛	1	10½	1	10⅞	1	11¼	1	11⅝	2	0	2	0¾	2	1½	2	3	2	4½	2	6	2	7½	2	9	3	3	3	6
4	2	0	2	1	2	2	2	3	2	4	2	4½	2	5	2	5½	2	6	2	6½	2	7	2	7½	2	8	2	9	2	10	3	0	3	2	3	4	3	6	3	8	4	4	4	8
5	2	6	2	7¼	2	8½	2	9¾	2	11	2	11⅝	3	0¼	3	0⅞	3	1½	3	2⅛	3	2¾	3	3⅜	3	4	3	5¼	3	6½	3	9	3	11½	4	2	4	4½	4	7	5	5	5	10
3	3	0	3	1½	3	3	3	4½	3	6	3	6¾	3	7½	3	8¼	3	9	3	9¾	3	10½	3	11¼	4	0	4	1½	4	3	4	6	4	9	5	0	5	3	5	6	6	6	7	0
7	3	6	3	7¾	3	9½	3	11¼	4	1	4	1⅞	4	2¾	4	3⅝	4	4½	4	5⅜	4	6¼	4	7⅛	4	8	4	9¾	4	11½	5	3	5	6½	5	10	6	1½	6	5	7	7	8	2
8	4	0	4	2	4	4	4	6	4	8	4	9	4	10	4	11	5	0	5	1	5	2	5	3	5	4	5	6	5	8	6	0	6	4	6	8	7	0	7	4	8	8	9	4
9	4	6	4	8¼	4	10½	5	0¾	5	3	5	4⅛	5	5¼	5	6⅜	5	7½	5	8⅝	5	9¾	5	10⅞	6	0	6	2¼	6	4½	6	9	7	1½	7	6	7	10½	8	3	9	9	10	6
10	5	0	5	2½	5	5	5	7½	5	10	5	11¼	6	0½	6	1¾	6	3	6	4¼	6	5½	6	6¾	6	8	6	10½	7	1	7	6	7	11	8	4	8	9	9	2	10	10	11	8
11	5	6	5	8¾	5	11½	6	2¼	6	5	6	6⅜	6	7¾	6	9⅛	6	10½	6	11⅞	7	1¼	7	2⅝	7	4	7	6¾	7	9½	8	3	8	8½	9	2	9	7½	10	1	11	11	12	10
12	6	0	6	3	6	6	6	9	7	0	7	1½	7	3	7	4½	7	6	7	7½	7	9	7	10½	8	0	8	3	8	6	9	0	9	6	10	0	10	6	11	0	13	0	14	0
13	6	6	6	9¼	7	0½	7	3¾	7	7	7	8⅝	7	10¼	7	11⅞	8	1½	8	3⅛	8	4¾	8	6⅜	8	8	8	11¼	9	2½	9	9	10	10	11	4½	11	11	14	1	15	2		
14	7	0	7	3½	7	7	7	10½	8	2	8	3¾	8	5½	8	7¼	8	9	8	10¾	9	0½	9	2¼	9	4	9	7½	9	11	10	6	11	1	11	8	12	3	12	10	15	2	16	4
15	7	6	7	9¾	8	1½	8	5¼	8	9	8	10⅞	9	0¾	9	2⅝	9	4½	9	6⅜	9	8¼	9	10⅛	10	0	10	3¾	10	7½	11	3	11	10½	12	6	13	1½	13	9	16	3	17	6
16	8	0	8	4	8	8	9	0	9	4	9	6	9	8	9	10	10	0	10	2	10	4	10	6	10	8	11	0	11	4	12	0	12	8	13	4	14	0	14	8	17	4	18	8
17	8	6	8	10¼	9	2½	9	6¾	9	11	10	1⅛	10	3¼	10	5⅜	10	7½	10	9⅝	10	11¾	11	1⅞	11	4	11	8¼	12	0½	12	9	13	5½	14	2	14	10½	15	7	18	5	19	10
18	9	0	9	4½	9	9	10	1½	10	6	10	8¼	10	10½	11	0¾	11	3	11	5¼	11	7½	11	9¾	12	0	12	4½	12	9	13	6	14	3	15	0	15	9	16	6	19	6	21	0
19	9	6	9	10¾	10	3½	10	8¼	11	1	11	3⅜	11	5¾	11	8⅛	11	10½	12	0⅞	12	3⅓	12	5⅝	12	8	13	0¾	13	5½	14	3	15	0½	15	10	16	7½	17	5	20	7	22	2
20	10	0	10	5	10	10	11	3	11	8	11	10½	12	1	12	3½	12	6	12	8½	12	11	13	1½	13	4	13	9	14	2	15	0	15	10	16	8	17	6	18	4	21	8	23	4
21	10	6	10	11¼	11	4½	11	9¾	12	3	12	5⅝	12	8¼	12	10⅞	13	1½	13	4⅛	13	6¾	13	9⅜	14	0	14	5¼	14	10½	15	9	16	7½	17	6	18	4½	19	3	22	9	24	6
22	11	0	11	5½	11	11	12	4½	12	10	13	0¾	13	3½	13	6¼	13	9	13	11¾	14	2½	14	5¼	14	8	15	1½	15	7	16	6	17	5	18	4	19	3	20	2	23	10	25	8
23	11	6	11	11¾	12	5½	12	11¼	13	5	13	7⅜	13	10⅜	14	1⅝	14	4½	14	7⅜	14	10¼	15	1⅜	15	4	15	9¾	16	3½	17	3	18	2½	19	2	20	1½	21	1	24	11	26	10
24	12	0	12	6	13	0	13	6	14	0	14	3	14	6	14	9	15	0	15	3	15	6	15	9	16	0	16	6	17	0	18	0	19	0	20	0	21	0	22	0	26	0	28	0
25	12	6	13	0¼	13	6½	14	0¾	14	7	14	10⅛	15	1¼	15	4⅜	15	7½	15	10⅝	16	1¾	16	4⅞	16	8	17	2¼	17	8½	18	9	19	9½	20	10	21	10½	22	11	27	1	29	2
26	13	0	13	6½	14	1	14	7½	15	2	15	5¼	15	8½	15	11¾	16	3	16	6¼	16	9½	17	0¾	17	4	17	10½	18	5	19	6	20	7	21	8	22	9	23	10	28	2	30	4
27	13	6	14	0¾	14	7½	15	2¼	15	9	16	0⅜	16	3¾	16	7⅛	16	10½	17	1⅞	17	5¼	17	8⅝	18	0	18	6¾	19	1½	20	3	21	4½	22	6	23	7½	24	9	29	3	31	6
28	14	0	14	7	15	2	15	9	16	4	16	7½	16	11	17	2½	17	6	17	9½	18	1	18	4½	18	8	19	3	19	10	21	0	22	2	23	4	24	6	25	8	30	4	32	8
29	14	6	15	1¼	15	8½	16	3¾	16	11	17	2⅝	17	6¼	17	9⅞	18	1½	18	5⅛	18	8¾	19	0⅜	19	4	19	11¼	20	6½	21	9	22	11½	24	2	25	4½	26	7	31	5	33	10
30	15	0	15	7½	16	3	16	10½	17	6	17	9¾	18	1½	18	5¼	18	9	19	0¾	19	4½	19	8¼	20	0	20	7½	21	3	22	6	23	9	25	0	26	3	27	6	32	6	35	0

RULE FOR CALCULATING PROPORTIONED WIDTH AND HEIGHT OF TREADS AND RISES OF STAIRS.

Subtract the width of tread from 25 in. and the result will be twice the height of the riser. Thus: if the tread is 10 in. wide, then $25 - 10 = 15 \div 2 = 7\frac{1}{2}$ in., the height or riser proportionate to a 10-inch tread. This is exclusive of nosings.



Memoranda for Breweries.

Kettle Measures

Barrels	A	B	C	D	E	F	G	H
50	8'.6"	7'.-	2'.-	5'.-	2'.-	2'.-	6"	3"
100	10'.6"	8'.6"	2'.6"	6'.-	2'.6"	.	8"	4"
150	11'.6"	9'.3"	.	7'.6"	.	2'.6"	.	.
200	12'.6"	10'.-	2'.10"	8'.6"	2'.10"	.	10"	5"
250	13'.6"	10'.6"	3'.-	9'.6"	3'.-	.	.	.
300	14'.6"	11'.-	.	10'.-	.	3'.-	12"	.
350	15'.-	11'.-	3'.6"	10'.6"	4'.-	.	.	.
400	16'.-	12'.-	4'.-	11'.-	.	.	.	.

Capacities for Appliances

Kettle	50 barls.	100 barls.	150 barls.	200 barls.	250 barls	300 barls.	400 barls.
Mash-tub	11'.- x 5'.-	12'.- x 6'.-	14'.- x 6'.-	15'.- x 6'.6"	16'.- 6'.-	17'. 7'	18'. 7'
Hop-jack	7' x 8' x 5'	8'. 9'. 6"	10'. 12'. 6"	11'. 14'. 6"	12'. 14'. 6"	14'. 15'. 7'	14'. 15'. 7'. 6"
Meal hopper	8'. 4'. 4'	8' x 6'. 4'	9'. 7'. 4. 6"	10'. 7'. 6". 5'	10'. 8'. 5'	11'. 8'. 5. 6"	12'. 10'. 6'
Beer tank	8'. 6" x 5'	10'. x 6"	12'. x 6"	14'. x 6'	15'. 6'	16'. x 6'. 6"	18'. 7'
Water tank	8'. 8'. 95 bar	10'. 9'. 165 bar	12'. 9. 240 bar	13'. 10'. 315 bar	14'. 10'. 6". 380 b	15'. 11'. 460 b	16'. 13'. 620 b
Rand' cooler Lengths of	27 tubes 14' long	34 tubes 16' long	42 tubes 16' long	42 tubes 18' long	42 tubes 20' long	48 tubes 20' long	2 ea 42 tubes 18' long
Grain tank hopper	6'. 6'. 3'. 6" 4'.-	8'. 8'. 4'. 6" 5'.-	8'. 10'. 5' 5'. 6"	10'. 10'. 5'. 6" 5'. 6"	10'. 12'. 6" 6'. 0"	11'. 13'. 6" 6'. 6"	12'. 15'. 7' 7'. 6"

Size of Swimming Tank.

FILE 725 74

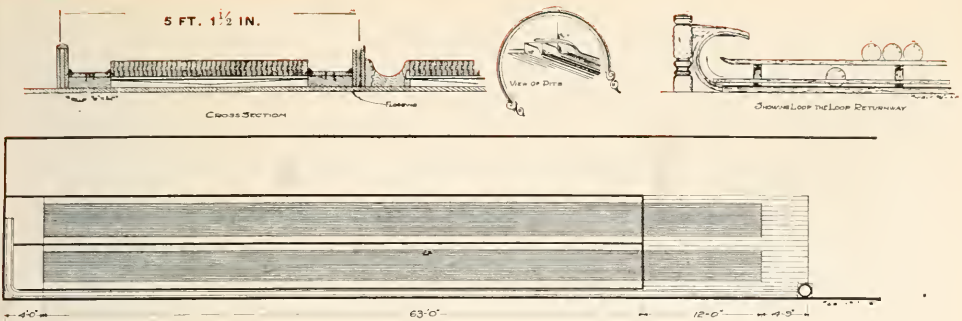
Swimming tanks that can be used for swimming contests must be exactly 20 yards in interior length, no more no less. (A tank ½ inch short would be ruled out of contest.) Eight yards wide is best, although 7 yards will pass; 4 feet deep at shallowest point and 8 feet deep at deepest point, which deepest point should be about 12 feet from end where springboard is placed. Depth at springboard end should be six feet. Interior of tank, both sides and bottom should be white, and there should be three black lines on the bottom extending parallel with sides, and dividing the tank into four equal alleys; there should be a line across tank on bottom and up sides at exactly 2 yards from each end, measured horizontally, making lines exactly 16 yards apart horizontally.

Size of the Billiard Room, Gas Light, Etc.

The space required for the different sized tables is as follows:

For table 6 x 12.....Room should be 16 x 22
For table 5½ x 11.....Room should be 15½ x 21
For table 5 x 10.....Room should be 15 x 20
For table 4½ x 9.....Room should be 14 x 18½
For table 4 x 8.....Room should be 13 x 17
For table 3½ x 7.....Room should be 12½ x 16

The following directions for arranging the lights over billiard tables will be found useful. The distance of the light from the floor should be about 6 feet 2 inches. For a 5½ by 11 table, cross-arms 31 inches and long arms 62 inches. For a 5 by 10 table, the cross-arms of the pendant should measure, from light to light, 28 inches and the long arm 56 inches. For a 4½ by 9 table, cross-arms 25 inches and long arms 50 inches. For a 4 by 8 table, cross-arms 22 inches and long arms 44 inches.



Important Points in Figuring Dimensions of a Stable.

FILE 728.942

The proper height and width of a stable door is not less than nine feet square. Width and height of vehicles is as follows:

	Height. Ft.	Height. In.	Length. Ft.	Width. Ft.	Width. In.
Brougham	7	0	11	6	0
Rockaway	7	0	11	6	0
Victoria	7	6	12	6	0
Phaeton	8	6	10	6	0
Berlin Coach	7	6	13	6	6
Landau	7	6	13	6	6
Body brake	9	0	11	7	0
Goddard phaeton	8	0	9	6	0
Stanhope	8	0	9	6	0
Buggy	9	0	9	6	0
Single trap	6	0	9	6	0
Mail coach	9	0	15	7	6
Omnibus	8	0	11	7	0

Horse Stalls.—Width, 3 feet 10 inches to 4 feet, or over 5 feet in width and 9 feet long. Width should not be between 4 and 5 feet, as in such cases the horse is liable to cast himself.

FILE 729.9

Spec. No.	No. of Stops.	From Back to Front Line of Case.	Width of Space Required.	Height Required for Swell-Box and Large Pipes.	Spec. No.	No. of Stops.	From Back to Front Line of Case.	Width of Space Required.	Height Required for Swell-Box and Large Pipes.
5	10	7′ 4″	11′ 6″	12′ 6″	20	21	12′ 9″	15′ 6″	17′
7	11	8′	11′ 6″	12′ 6″	22	22	13′ 4″	15′ 6″	17′
8	12	8′	12′ 6″	12′ 6″	23	23	13′ 6″	15′ 6″	17′
10	13	8′ 7″	12′ 6″	12′ 6″	25	24	14′	15′ 6″	17′
11	14	9′ 3″	12′ 6″	12′ 6″	26	25	14′ 6″	15′ 6″	17′
13	16	10′ 5″	12′ 6″	12′ 6″	28	26	14′ 6″	15′ 6″	17′
14	17	11′	14′ 8″	17′	29	27	14′ 6″	16′ 4″	17′ 6″
16	18	11′ 7″	14′ 8″	17′	31	28	15′	16′ 4″	17′ 6″
17	19	12′ 2″	14′ 8″	17′	32	29	15′ 6″	16′ 4″	17′ 6″
19	20	12′ 9″	14′ 8″	17′	34	30	15′ 6″	17′	17′ 6″

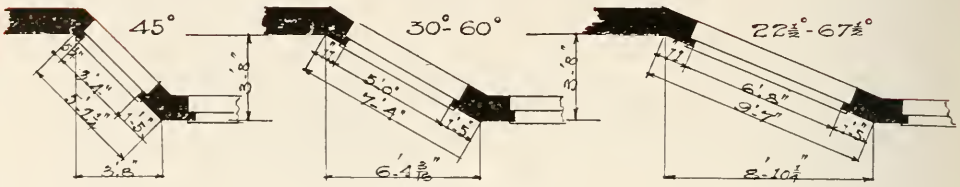
Add 40″ more from Front Line of Case for Keydesk Pedals and Seat.

Sizes of Piano.

7⅓ Octaves.

	Height.	Length.	Width.
Upright	about 4 ft. 3 in.	5 ft. 4 in.	2 ft. 3 in.
Small or Baby Grand	about 3 ft. 2 in.	6 ft. 0 in.	4 ft. 10 in.
Parlor Grand	about 3 ft. 2 in.	7 ft. 6 in.	5 ft. 0 in.

Table Showing the Length of Sides of Bays, Angle being 45, 30-60 and 22½-67½ Degrees.



Examples.

Angle of 45 Degrees.

1	ft.	6	in.	by	1	ft.	6	in.	2	ft.	1 7/16	in.	2	ft.	10	in.	by	2	ft.
1	"	7	"	"	1	"	7	"	2	"	2 7/8	"	2	"	11	"	"	2	"
1	"	8	"	"	1	"	8	"	2	"	4 1/4	"	3	"	0	"	"	3	"
1	"	9	"	"	1	"	9	"	2	"	5 11/16	"	3	"	1	"	"	3	"
1	"	10	"	"	1	"	10	"	2	"	7 1/8	"	3	"	2	"	"	3	"
1	"	11	"	"	1	"	11	"	2	"	8 1/2	"	3	"	3	"	"	3	"
2	"	0	"	"	2	"	0	"	2	"	9 13/16	"	3	"	4	"	"	3	"
2	"	1	"	"	2	"	1	"	2	"	11 3/8	"	3	"	5	"	"	3	"
2	"	2	"	"	2	"	2	"	3	"	0 3/4	"	3	"	6	"	"	3	"
2	"	3	"	"	2	"	3	"	3	"	2 1/16	"	3	"	7	"	"	3	"
2	"	4	"	"	2	"	4	"	3	"	3 5/8	"	3	"	8	"	"	3	"
2	"	5	"	"	2	"	5	"	3	"	5	"	3	"	9	"	"	3	"
2	"	6	"	"	2	"	6	"	3	"	6 7/16	"	3	"	10	"	"	3	"
2	"	7	"	"	2	"	7	"	3	"	7 7/8	"	3	"	11	"	"	4	"
2	"	8	"	"	2	"	8	"	3	"	9 1/4	"	4	"	0	"	"	4	"
2	"	9	"	"	2	"	9	"	3	"	10 11/16	"							

2	ft.	10	in.	by	2	ft.	10	in.	4	ft.	0 1/16	in.							
2	"	11	"	"	2	"	11	"	4	"	1 1/2	"							
3	"	0	"	"	3	"	0	"	4	"	2 13/16	"							
3	"	1	"	"	3	"	1	"	4	"	4 5/16	"							
3	"	2	"	"	3	"	2	"	4	"	5 3/4	"							
3	"	3	"	"	3	"	3	"	4	"	7 1/8	"							
3	"	4	"	"	3	"	4	"	4	"	8 9/16	"							
3	"	5	"	"	3	"	5	"	4	"	10	"							
3	"	6	"	"	3	"	6	"	4	"	11 3/8	"							
3	"	7	"	"	3	"	7	"	5	"	1 5/16	"							
3	"	8	"	"	3	"	8	"	5	"	2 1/4	"							
3	"	9	"	"	3	"	9	"	5	"	3 5/8	"							
3	"	10	"	"	3	"	10	"	5	"	5 1/16	"							
3	"	11	"	"	3	"	11	"	5	"	6 1/2	"							
4	"	0	"	"	4	"	0	"	5	"	7 7/8	"							

Angle of 30-60 Degrees.

1	ft.	6	in.	by	2	ft.	7 3/16	in.	3	ft.	0	in.	2	ft.	10	in.	by	4	ft.
1	"	7	"	"	2	"	8 15/16	"	3	"	2	"	2	"	11	"	"	5	"
1	"	8	"	"	2	"	10 5/8	"	3	"	4	"	3	"	0	"	"	5	"
1	"	9	"	"	3	"	0 3/8	"	3	"	6	"	3	"	1	"	"	5	"
1	"	10	"	"	3	"	2 1/8	"	3	"	8	"	3	"	2	"	"	5	"
1	"	11	"	"	3	"	3 13/16	"	3	"	10	"	3	"	3	"	"	5	"
2	"	0	"	"	3	"	5 5/16	"	4	"	0	"	3	"	4	"	"	5	"
2	"	1	"	"	3	"	7 1/16	"	4	"	2	"	3	"	5	"	"	5	"
2	"	2	"	"	3	"	9 1/16	"	4	"	4	"	3	"	6	"	"	6	"
2	"	3	"	"	3	"	10 3/4	"	4	"	6	"	3	"	7	"	"	6	"
2	"	4	"	"	4	"	0 1/2	"	4	"	8	"	3	"	8	"	"	6	"
2	"	5	"	"	4	"	2 1/4	"	4	"	10	"	3	"	9	"	"	6	"
2	"	6	"	"	4	"	3 15/16	"	5	"	0	"	3	"	10	"	"	6	"
2	"	7	"	"	4	"	5 11/16	"	5	"	2	"	3	"	11	"	"	6	"
2	"	8	"	"	4	"	7 7/16	"	5	"	4	"	4	"	0	"	"	6	"
2	"	9	"	"	4	"	9 3/16	"	5	"	6	"							

2	ft.	10	in.	by	4	ft.	10 7/8	in.	5	ft.	8	in.							
2	"	11	"	"	5	"	0 5/8	"	5	"	10	"							
3	"	0	"	"	5	"	2 3/8	"	6	"	0	"							
3	"	1	"	"	5	"	4 1/16	"	6	"	2	"							
3	"	2	"	"	5	"	5 13/16	"	6	"	4	"							
3	"	3	"	"	5	"	7 9/16	"	6	"	6	"							
3	"	4	"	"	5	"	9 5/16	"	6	"	8	"							
3	"	5	"	"	5	"	11	"	6	"	10	"							
3	"	6	"	"	6	"	0 3/4	"	7	"	0	"							
3	"	7	"	"	6	"	2 1/2	"	7	"	2	"							
3	"	8	"	"	6	"	4 5/16	"	7	"	4	"							
3	"	9	"	"	6	"	5 15/16	"	7	"	6	"							
3	"	10	"	"	6	"	7 11/16	"	7	"	8	"							
3	"	11	"	"	6	"	9 7/16	"	7	"	10	"							
4	"	0	"	"	6	"	11 1/8	"	8	"	0	"							

Angle of 22½-67½ Degrees.

1	ft.	6	in.	by	3	ft.	7 7/16	in.	3	ft.	11	in.	2	ft.	10	in.	by	6	ft.
1	"	7	"	"	3	"	9 7/8	"	4	"	1 5/8	"	2	"	11	"	"	7	"
1	"	8	"	"	4	"	0 5/16	"	4	"	4 5/16	"	3	"	0	"	"	7	"
1	"	9	"	"	4	"	2 1/16	"	4	"	6 7/8	"	3	"	1	"	"	7	"
1	"	10	"	"	4	"	5 1/8	"	4	"	9 1/2	"	3	"	2	"	"	7	"
1	"	11	"	"	4	"	7 1/2	"	5	"	0 1/8	"	3	"	3	"	"	7	"
2	"	0	"	"	4	"	9 15/16	"	5	"	2 1/16	"	3	"	4	"	"	8	"
2	"	1	"	"	5	"	0 3/8	"	5	"	5 3/8	"	3	"	5	"	"	8	"
2	"	2	"	"	5	"	2 3/4	"	5	"	7 15/16	"	3	"	6	"	"	8	"
2	"	3	"	"	5	"	5 3/16	"	5	"	10 9/16	"	3	"	7	"	"	8	"
2	"	4	"	"	5	"	7 5/8	"	6	"	1 1/16	"	3	"	8	"	"	8	"
2	"	5	"	"	5	"	10	"	6	"	3 1/4	"	3	"	9	"	"	9	"
2	"	6	"	"	6	"	0 7/16	"	6	"	6 3/8	"	3	"	10	"	"	9	"
2	"	7	"	"	6	"	2 13/16	"	6	"	9	"	3	"	11	"	"	9	"
2	"	8	"	"	6	"	5 1/4	"	6	"	11 5/8	"	4	"	0	"	"	9	"
2	"	9	"	"	6	"	7 11/16	"	7	"	2 1/4	"							

2	ft.	10	in.	by	6	ft.	10 1/16	in.	7	ft.	4 13/16	in.							
2	"	11	"	"	7	"	0 1/2	"	7	"	7 7/16	"							
3	"	0	"	"	7	"	2 13/16	"	7	"	10 1/8	"							
3	"	1	"	"	7	"	5 5/16	"	8	"	0 11/16	"							
3	"	2	"	"	7	"	7 3/4	"	8	"	3 5/16	"							
3	"	3	"	"	7	"	10 1/4	"	8	"	5 15/16	"							
3	"	4	"	"	8	"	0 9/16	"	8	"	8 1/2	"							
3	"	5	"	"	8	"	3	"	8	"	11 1/8	"							
3	"	6	"	"	8	"	5 3/8	"	9	"	1 3/4	"							
3	"	7	"	"	8	"	7 13/16	"	9	"	4 3/8	"							
3	"	8	"	"	8	"	10 1/4	"	9	"	7	"							
3	"	9	"	"	9	"	0 5/8	"	9	"	9 9/16	"							
3	"	10	"	"	9	"	3 1/16	"	10	"	0 3/16	"							
3	"	11	"	"	9	"	5 7/16	"	10	"	2 13/16	"							
4	"	0	"	"	9	"	9 7/8	"	10	"	5 7/16	"							

WEIGHT OF BRICKWORK.

FILE 693.2

Placing the weight of brickwork at 112 lb. per cubic foot, the weights per superficial foot for different walls are:

9 inch wall	84 lb.
13 inch wall	121 lb.
18 inch wall	168 lb.
22 inch wall	205 lb.
26 inch wall	243 lb.

MEASUREMENT OF OLD BRICK.

Uncleaned rough from building dumped from 8 to 10 bricks per cubic foot, or average of 111 cubic feet to the M.

Uncleaned stacked on outside and interior of stack filled promiscuously 10-12 per cubic feet, or average of 91 cubic feet to the M.

Cleaned and closely stacked, 16 to 18 bricks per cubic foot, or actual average of 59 cubic foot to M. (Usually sold at 60 cubic feet to M to allow for waste and poor piling.)

Cleaned stacked on outside and interior filled promiscuously, 12 to 14 per cubic foot, or actual average of 77 cubic feet to M. (When sold from pile measure customary to count 80 cubic feet to M, to allow for waste and bats.)

Measurement of New Brick Work.

The Chicago Masons and Builders' Association have arbitrarily assumed that a cubic foot of wall contains 22½ common brick, or 7½ brick to the superficial foot of 4-inch wall and 15 brick to the superficial foot of 8-inch wall. These figures of the Mason's and Builders' Association are frequently used for the appraisal of party walls, etc., but if so used, the price per M for work in wall should be reduced accordingly.

The actual number of Chicago common brick required for a cubic foot of solid wall varies from 17½ to 19½, and masons in purchasing brick usually reserve 18 brick per cubic foot of solid wall, and when so doing, rarely find an excess or shortage at the end of construction. When the walls are divided into many small piers, requiring much cutting, and consequently much waste, it is best to figure 20 brick to the cubic foot.

On account of the wide variance of practice on the part of masons in estimating, architects, when calling for estimates on brick work by the thousand, will avoid useless controversy by stipulating that quantity of brick will be determined by superficial wall measurement according to the following rule, which is very nearly correct, as Chicago brick now run. Divide the total number of superficial feet of wall surface of a given thickness by 160, and multiply the result by the number of brick widths the wall is thick, and the result will equal the number of thousands of brick contained. A four-inch wall will contain 6¾ brick to the superficial foot, or 1,000 brick to 160 square feet.

Miscellaneous Masonry Data.

A fireproof floor constructed of iron beams and four-inch brick arches will weigh from 65 to 75 pounds per superficial foot.

The safe and proper bearing of joist, timber and girders supporting a floor should not exceed ten tons on brick walls and fourteen tons on good stone walls.

A fireproof floor constructed of iron beams and of iron arches made of No. 18 iron, and filled in on top with concrete or slag and cement, will weigh about the same as brickwork four inches thick.

Lath and plastering, two-coat work, weighs from 9 to 12 pounds per superficial foot.

One hundred yards of plastering will require fourteen hundred laths, four and a half bushels of lime, four-fifths of a load of sand, nine pounds of hair and five pounds of nails, for two-coat work.

A load of mortar measures a cubic yard, requires a cubic yard of sand and nine bushels of lime, and will fill thirty hods.

A bricklayer's hod measuring one foot four inches by nine inches, equals 1,296 cubic inches in capacity, and contains twenty bricks.

A single load of sand or other materials equals a cubic yard.

FRAMED AND BOXED CONSTRUCTION CARPENTRY, STRUCTURAL AND ORNAMENTAL IRON.

ESTIMATE DATA FOR ORDINARY STUD AND JOIST CONSTRUCTION.

By EMERY STANFORD HALL, B S.

No hard and fast rule can be laid down for estimating. There are so many practical exigencies which alter assumed or average conditions that experience and judicial capacity are essential to successful estimating. Manifestly a well organized force commanded by men of executive ability can accomplish more and better work in less time and with less waste than a poor organization of inefficient men under incapable direction. Likewise work easily accessible and simple in design can be executed by any force with less waste and in less time than complicated work or work executed at a high altitude, requiring much scaffolding and hoisting apparatus.

FLOOR FRAMING.

The number of joists required is always in excess of the number which would naturally be called for by uniform spacing as indicated in Fig. 1 "Floor Construction, type C." Extra joists have to be put in to form trimmers and headers around chimneys, stair-wells, and other openings in floors. Also, joists should be doubled under partitions with block separators between so as to permit pipes passing through without cutting. These conditions, as illustrated below in Fig. 1, "Type E Floor Construction," show a case where 14 joists are required in only ten uniform spacings, which is extreme, but taking an average of type "E" and type "C," conditions which occur with about equal frequency in buildings of average requirements, it is reasonable to assume that two extra joists will be required for every ten feet.

Number of thousands of board feet in joists for any uniform bent of any building, with any length of joists, when width of bent plus the joist bearing on walls or girders = l; any stretch or depth of the bent parallel to joist bearings = L; any uniform distance between centers of joists = s; and J = the result:—$J = \frac{\frac{bdl}{12}}{1000}\left(\frac{2L}{10}+\frac{L}{s}\right)$. $\frac{bdl}{12}$ = the number of board feet of material in a piece of timber (b) thick by (d) in depth and (l) in length, and the values of same for material most generally used are given in table A.

Let $\frac{bdl}{12}=B$.

(1.) $J=\frac{B}{1000}\left(\frac{2L}{10}+\frac{L}{s}\right)$. s is commonly equal either to 1 ft. or 1⅓ ft. Substituting 1 for value of s = joists placed 12″ from C.

(2.) J = .0012 L B. Substituting 1⅓ for value of s = joists placed 16″ from C.

(3.) J = .00095 L B.

(4.) J = .0008 L B.

To find the average amount of material contained in a square of 100 sq. ft. floor construction take a value of B corresponding to l = 10, and a value of L = 10 and substitute in either formula (1.), (2.) or (3.) according to spacing desired. The following "Table I" gives the result of such substitution for some of the more commonly used sizes of joists:

TABLE I.

l = 10
L = 10

Number of M's of bd. ft. in a square of 100 sq. ft. for various joists in construction

b d	$\frac{10\ b\ d}{12}=B$	J s=1	J s=1⅓	J s=1⅔
2 x 2	3.34	.04008	.031730	.06720
2 x 4	6.67	.08004	.063365	.05336
2 x 6	10.00	.12000	.095000	.08000
2 x 8	13.34	.16008	.126730	.10672
2 x 10	16.67	.20004	.158365	.13336
2 x 12	20.00	.24000	.190000	.16000
2 x 14	23.34	.28008	.221730	.18672
2 x 16	26.67	.32004	.253365	.21336
3 x 6	15.00	.18000	.142500	.12000
3 x 8	20.00	.24000	.190000	.16000
3 x 10	25.00	.30000	.237500	.20000
3 x 12	30.00	.36000	.285000	.24000
3 x 14	35.00	.42000	.332500	.28000
3 x 16	40.00	.48000	.380000	.32000
4 x 4	13.34	.16008	.126730	.10672
4 x 6	20.00	.24000	.190000	.16000
4 x 8	26.67	.32004	.233365	.21336
4 x 10	33.34	.40008	.316730	.26672
4 x 12	40.00	.48000	.380000	.32000
4 x 14	46.67	.56004	.443365	.37336
4 x 16	53.34	.64008	.506730	.42672
COL. I	COL. II	COL. III	COL. IV	COL. V

Col. I gives size of joists or sticks of timber. Col. II gives the number of board feet in a stick of the size given in Col. I and 10 ft. long. Col. III gives the amount of M of bd. ft. of framing material contained in a square of 100 sq. ft. for joists of the size given in Col. I when these joists are placed 12″ from centers; Col. IV when placed 16″ from centers; Col. V when placed 20″ from centers.

Bridging where placed 8 ft. on centers requires 12 pairs to the square where joists are placed 12″ from centers; 9¾ pair where joists are placed 16″ from centers.

PARTITION CONSTRUCTION.

The amount of material and labor involved in the various types of ordinary stud partitions is practically uniform for a given height of partition, spacing of studs and size of same. See types "F" and "G" in illustration below. Type "F" has two layer bottom plate or shoe, 1 line of block-bridging and a single layer top-plate, while type "G" has two layer bottom-plate or shoe and two layer cap-plate with no block-bridging, giving the same actual amount of material. Stud partitions are usually spaced out and studs set on uniform spacing, regardless of openings; then the openings are cut and the studs around same doubled, requiring extra studs, as the posts at sides of openings rarely happen to fall on the line with studs originally placed. Door opening Fig. 1, type "A" is usual condition. Door opening Fig. 1, type "B," where both posts fall in line with studs as first set, is a type which almost never occurs in actual practice and so cannot be considered as a possible saving on material. "Section AA," Fig. 1, shows connecting partitions from various directions and makes clear the necessity for extra studs above the number required for regular spacing to provide for angles. It will be seen that every angle requires from 2 to 4 extra studs. The pieces of studs cut out for openings are used for doubling, but there are not sufficient to supply all extra studding needed.

Number of thousands of board feet in studs for any partition with any length of studs, when length of studs between shoe and cap-plate = h; any length of partition measured in the horizontal direction and through all angles, so as to increase the actual length of partition by the thickness of same at angles = L; any uniform distance between centers of studs = s; and Q = the result:

Observing Fig. 1, it will be seen that average value of $Q = \left[\frac{\left(\frac{L}{s}+\frac{8L}{10}\right)h+4L}{1000}\right]\frac{ft.}{12}\cdot\frac{ft.}{14}=$ the number of board feet of material in a piece of timber or stud; (f) face by (t) thickness and one ft. in length and the values of same for sizes of material most generally used are given in Table II, Col. II. Let $\frac{ft}{12}=F$.

(5.) $Q = F\left[\frac{\left(\frac{L}{s}+\frac{8L}{10}\right)h+4L}{1000}\right]$. s is commonly equal either to 1 or 1⅓, sometimes 1⅔. Substituting 1′ for value of s = studs placed 12″ from C.

(6.) $Q = \left(\frac{1.8Lh+4L}{1000}\right)F.$

TABLE II.

Size of studs	L=10	12 spacing	16 spacing	20 spacing
f x t	$\frac{ft}{12}=F$	$Q_{h=10}^{s=1}$	$Q_{h=10}^{s=1\frac{1}{3}}$	$Q_{h=10}^{s=1\frac{2}{3}}$
1″x 1″	.084	.01848	.016380	.01512
1 x 2	.167	.03674	.03240	.30060
2 x 2	.334	.07348	.06480	.06012
2 x 3	.500	.11000	.09750	.09000
2 x 4	.667	.14674	.11027	.12006
2 x 6	1.000	.22000	.19500	.18000
2 x 8	1.334	.29348	.26013	.24012
3 x 4	1.000	.22000	.19500	.18000
3 x 6	1.500	.33000	.29250	.27000
3 x 8	2.000	.44000	.38000	.36000
4 x 4	1.334	.30448	.26013	.24012
4 x 6	2.000	.440000	.39000	.36000
4 x 8	2.667	.58675	.52007	.48006
COL. I	COL. II	COL. III	COL. IV	COL. V

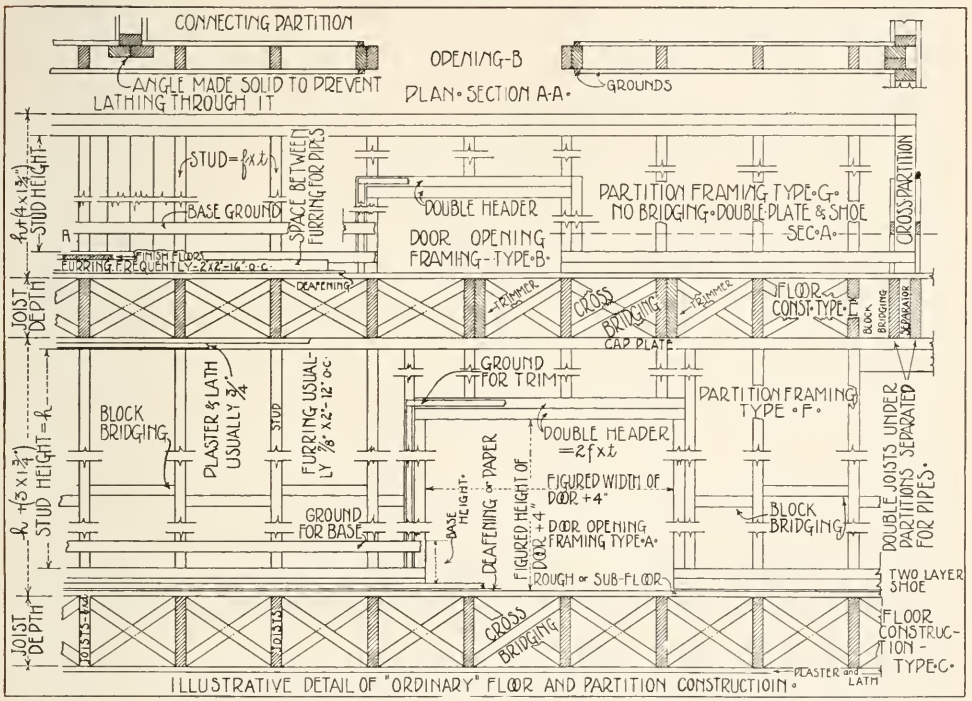


Fig. 1.

Substituting 1⅓′ for value of s = studs spaced 16″ from c.

(7.) $\left(\frac{1.55Lh+4L}{1000}\right)F.$

Substituting 1⅔′ for value of s = studs spaced 20″ from c.

(8.) $\left(\frac{1.4Lh+4L}{1000}\right)F.$

To find the average number of M's of bd. ft. of framing material contained in a square of 100 sq. ft. of partition construction take a value of F corresponding to size of studs used (see Col. II, Table II below) and a value of L = 10 and substitute in either formula (5.), (6.), (7.) or (8.), according to spacing desired. This really will give a partition three or four × f greater in one dimension than 10 ft., but this should be allowed extra for places where the material will not cut to advantage. The following Table II gives the result of such substitution for some of the more commonly used sizes of joists. (6.) becomes Q = .22 F; (7.) becomes Q = .195 F; (8.) becomes Q = .18 F.

Col. I gives sizes of studs or furring strips. Col. II gives the number of board feet in a stick of the size given in Col. I and one ft. long. Col. III gives the number of M's of bd. ft. of framing material contained in a square of 100 sq. ft. of stud partition or furring, including extras and waste if constructed of studs of the size indicated in Col. 1 and spaced 12″ from centers; Col. IV, spaced 16″ from centers; Col. V, spaced 20″ from centers.

Grounds are usually placed for nailing base-boards, dado-caps, and trim around openings. These are sometimes made 1″ x 1″ and sometimes 1″ x 2″ and are put up on both sides of partitions.

Number of thousands of board feet in grounds for a partition of any length and height = G = $\left(\frac{4L+5hO}{1000}\right)$. F when O = the number of openings and can be assumed to average $\frac{L}{10}$;

(9.) $G=\left(\frac{4L+.5Lh}{1000}\right)F.$

For one square L = 10, h = 10, then G = .09 F. Value of F can be substituted from Table II, Col. II.

For 1" x 1" grounds G = .00756 M; for 1" x 2" G = .01503 M bd. ft.

EXTERIOR WALL CONSTRUCTION.

Frame exterior wall construction is so similar to interior stud partition construction that for purposes of estimating quantity of material to determine cost Table II may be used for estimating this work.

Furring is applied to exterior masonry walls, usually 1" x 2" spaced either 12" or 16" from centers; similar furring is sometimes applied to the under side of joists to receive lath and also on top of rough floors to afford space for pipes; but here it is frequently 2" x 2". Not as much extra furring is actually put into the building as extra studs estimated in Table II, but there is so much waste of this material that amounts given in Table II should be used in estimating.

Coverings of Partitions, Walls, Floors and Ceilings are measured by the surface area of each layer. Most such material is either lapped, matched or otherwise cut to waste, so that the surface area purchased will not cover the same amount of frame surface. This varies with different materials and the following table gives values of the factor W, by which the actual measurement of surfaces must be multiplied to determine the amount of material which must be purchased.

TABLE III.

W = 1 for plain boards laid close.
W = .65 for 1" x 4" battens placed 6" from c.
W = .75 for 1" x 6" battens placed 8" from c.
W = 1.13 for 6" to 8" D. and M. flooring or sheathing.
W = 1.19 for 4" D. and M. flooring or ceiling.
W = 1.25 for 3" D. and M. flooring or ceiling.
W = 1.34 for 2" D. and M. flooring.
W = 1.75 for 1½" D. and M. flooring.
W = 1.30 for 6" siding 4¼ to weather.
W = 1.38 for 4" siding 2½ to weather.
W = 1. For most felts and papers as these are usually listed for enough less than the roll actually contains to allow for lapping.

LABOR.

Wages for labor are paid by the hour and are governed by union scales. Let hourly wage = H = 60c in Chicago at this time.

Labor required to place and finish material is usually approximated either by the time required to erect a square of surface of framing for partitions, walls, floors, or of layers of covering, or by the time required to place one M bd. ft. of material or M sq. ft. of surface in the case of sheet coverings. The latter method is the more practical and involves less work in estimating, as these quantities have to be determined in estimating the material.

The following table gives the approximate number of hours it will take an average mechanic to place one thousand (M) board feet or surface feet of material of the various sorts and for various purposes enumerated.

TABLE IV.

Framing Stuff. Hours required to place 1 M.
2"x 3" studs require 35 hours to place 1 M.
2" x 4" and 2" x 6" studs require 32 hours to place 1 M.
2" x 8" studs require 30 hours to place 1 M.
1" x 1" grounds require 83 hours to place 1 M.
1" x 2" grounds and furring require 64 hours to place 1 M.
2" x 2" grounds and furring require 50 hours to place 1 M.
1" x 8" to 10" sheathing require 30 hours to place 1 M.
1" x 4" roof sheathing or slats require 26 hours to place 1 M.
1" x 6" roof sheathing or slats require 26 hours to place 1 M.
Shingles laid 4½" to W. require 5.8 hours to place 1 M.
1000 sq. ft. paper or felt require ¾ hours to place 1 M.
1" x 8" and 1" x 6" D. & M. sheathing require 25 hours to place 1 M.
1" x 4" D. & M. sheathing require 26 hours to place 1 M.
2" x 4" and 2" x 6" D. & M. sheathing require 20 hours to place 1 M.
3" x 4" D. & M. sheathing require 14 hours to place 1 M.
3" x 6", 3" x 8", 4" x 4" and 4" x 6" D. & M. sheathing require 16.6 hours to place 1 M.
4" x 8" D. & M. sheathing require 15 hours to place 1 M.
1" x 1½" and 1" x 2" D. & M. hardwood flooring require 66 hours to place 1 M.
1" x 3" D. & M. hardwood flooring require 58 hours to place 1 M.
1" x 4" D. & M. hardwood flooring require 53 hours to place 1 M.
1¼" x 2" D. & M. hardwood flooring require 63 hours to place 1 M.
1¼" x 3" D. & M. hardwood flooring require 60 hours to place 1 M.
2" x 4" and 2" x 6" rafters require 33 hours to place 1 M. bd. ft.
2" x 8" rafters require 30 hours to place 1 M. bd. ft.
2" x 6" and 2" x 8" joists require 25 hours to place 1 M. bd. ft.
2" x 10" joists require 21.5 hours to place 1 M. bd. ft.
2" x 12" and 2" x 14" joists require 20 hours to place 1 M. bd. ft.
3" x 8" and 3" x 10" joists require 20 hours to place 1 M. bd. ft.
3" x 12", 3" x 14" and 3" x 16" joists require 18 hours to place 1 M. bd. ft.
4" x 8" and 4" x 10" joists require 20 hours to place 1 M. bd. ft.
4" x 12" and 4" x 14" joists require 18.7 hours to place 1 M. bd. ft.
4" x 16" joists require 16.7 hours to place 1 M. bd. ft.
6" x 6" joists require 20 hours to place 1 M. bd. ft.
6" x 8" and 6" x 10" joists require 18.7 hours to place 1 M. bd. ft.
6" x 12" and all stuff up to 16" x 16" for joists require 16.7 hours to place 1 M.
4" x 4" posts require 23 hours to place 1 M. bd. ft.
6" x 6" posts require 20 hours to place 1 M. bd. ft.
8" x 8" posts require 18 hours to place 1 M. bd. ft.
10" x 10", 12" x 12", 14" x 14" and 16" x 16" posts require 16.7 hours to place 1 M. bd. ft.

TRIM OR FINISH.

It is impossible to give any accurate idea of the amount of time required to do this class of work, there are so many conditions that enter into consideration that can not be stipulated in a table.

Openings require in labor to put in blocks, set jambs or frames, place trim, hang doors or windows and put on hardware from 6 to 12 hours, but average in all sorts of work and buildings about 9 hours.

Baseboard, one member, 1000 lin. ft. requires 50 hours to place.

Baseboard, two member, 1000 lin. ft. requires 66 hours to place.

Baseboard, three member, 1000 lin. ft. requires 83 hours to place.

Plate-shelf, 3 part, consisting of shelf, apron and mould, 1000 lin. ft. requires 100 hours to place; add 1-6 hour for each bracket.

Wainscoting, plain beaded D. & M., requires 23 hours to place 1 M. bd. ft.

Paneled Wainscoting from 2′ to 4′ 6″ high requires about 83 hours to place 1000 lin. ft.

Picture Moulding requires about 33 hours to place 1000 lin. ft.

Ceiling Beams, consisting of blocks, 3 sides and 2 to 4 mouldings, require about 250 hours to place 1000 lin. ft.

Seat with back and sides requires about 8 hours to place.

THE ESTIMATE.

The estimate at best can be little more than an intelligent guess based on past experience. One can never be sure that the same conditions will prevail in the job to be executed as have prevailed in the one just completed. No attempt has been made to suggest a method of estimating cost of interior trim or exterior cornice frames, etc.

Estimated Cost of Rough Work, Floors and Roofs = [(**J** taken from Table 1 × **N**, taken from Table IV × **union wages per hour,** taken from union scale governing in the locality) + **J** × (**price per M of material,** obtained from material dealer at the time of making estimate) + (the following for each layer of covering) $\left(\frac{100W}{1000}\right.$, taken from Table III × price per M of material) + $\left.\left(\frac{100W}{1000} \times N \times H\right)\right]$ times the number of squares of this sort of construction contained in the building.

Estimate for partition work, proceed in same manner as for floor, only substitute from proper table.

Example—Estimate the cost of a 2″ x 4″ stud partition 11 ft. high and 137 ft. long broken around various rooms and having studs placed 16″ from centers and 1″ x 1″ grounds.

Area = 137 × 11 = 1507 sq. ft. = 15.07 squares. Q = .11027 from Table II, Col. IV, **Dealer's price** per **M** = $25.00, **N** 2″ x 4″ studs from Table IV = .5 hr. **H** = $.60. **G** from formulae (9.) = .00756 and **N** from Table IV = 2 hr.; then [(.11027 × $25.00) + (.00756 × $26.00) + (.11027 × .5 × $0.60) + (.00756 × 2 × $0.60)] 15.07 =

Length in Feet of Joists, Scantling and Timber.

FILE 694.0

Size in Inches	12	14	16	18	20	22	24	26	28	30	42	44	45
2 x 4	8	9	11	12	13	15	16	17	19	20	28	29	30
2 x 6	12	14	16	18	20	22	24	26	28	30	42	44	45
2 x 8	16	19	21	24	27	29	32	35	37	40	56	58	60
2 x 10	20	23	27	30	33	37	40	43	47	50	70	74	75
2 x 12	24	28	32	36	40	44	48	52	56	60	84	88	90
3 x 4	12	14	16	18	20	22	24	26	28	30	42	44	45
3 x 6	18	21	24	27	30	33	36	39	42	45	63	66	68
3 x 8	24	28	32	36	40	44	48	52	56	60	84	88	90
3 x 10	30	35	40	45	50	55	60	65	70	75	105	110	113
3 x 12	36	42	48	54	60	66	72	78	84	90	126	132	135
4 x 4	16	19	21	24	27	29	32	35	37	40	56	58	60
4 x 6	24	28	32	36	40	44	48	52	56	60	84	88	90
4 x 8	32	37	43	48	53	59	64	69	75	80	112	118	120
4 x 10	40	47	53	60	67	73	80	87	93	100	140	146	150
4 x 12	48	56	64	72	80	88	96	104	112	120	168	176	180
6 x 6	36	42	48	54	60	66	72	78	84	90	126	132	135
6 x 8	48	56	64	72	80	88	96	104	112	120	168	176	180
6 x 10	60	70	80	90	100	110	120	130	140	150	210	220	225
6 x 12	72	84	96	108	120	132	144	156	168	180	250	265	270
8 x 8	64	75	85	96	107	117	128	139	149	160	224	234	240
8 x 10	80	93	107	120	133	147	160	173	187	200	280	294	300
8 x 12	96	112	128	144	160	176	192	208	224	240	336	352	360
10 x 10	100	117	133	150	167	183	200	217	233	250	350	366	375
10 x 12	120	140	160	180	200	220	240	260	280	300	420	440	450
12 x 12	144	168	192	216	240	264	288	312	336	360	504	528	540
12 x 14	168	196	224	252	280	308	336	364	392	420	588	616	630
14 x 14	196	220	261	294	327	359	392	425	457	480	686	718	735

NAILS REQUIRED FOR DIFFERENT KINDS OF WORK.

FILE 694.231

For 1,000 shingles, 3½ to 5 lbs. 4*d.* nails, or 3 to 3½ lbs. 3*d.*

For 1,000 laths, about 7 lbs. 3*d.* fine.

For 1,000 feet clapboards, about 18 lbs. 6*d.* box.

For 1,000 feet covering boards, about 20 lbs. 8*d.* common, or 25 lbs. 10*d.*

For 1,000 feet upper floors, square edged, about 38 lbs. 10*d.* floor, or 41 lbs. 12*d.* floor.

For 1,000 feet upper floors, matched and blind-nailed, 38 lbs. 10*d.*, or 42 lbs. 12*d.* common.

For 10 feet partitions, studs or studding, 1 lb. 10*d.* common.

For 1,000 feet furring, 1x3, about 45 lbs. 10*d.* common.

For 1,000 feet furring, 1x2, about 65 lbs. 10*d.* common.

For 1,000 feet pine finish, about 30 lbs. 8*d.* finish.

OVERLAYING CONSTRUCTION SHEET, SHINGLE AND COMPOSITION COVERING.

FILE 695.1

The average width of a shingle is four inches. Hence, when shingles are laid four inches to the weather each shingle averages 16 square inches, and 900 are required for a square of roofing (100 square feet). If 4½ inches to the weather, 800; 5 inches, 720; 5½ inches, 655; 6 inches, 600.

Slating.

FILE 695.2

Slating is estimated by the "square," which is the quantity required to cover 100 square feet. The slates are usually laid so that the third laps the first three inches.

Number of Slates per Square.

Size in Inches.	Pieces per Square.	Size in Inches.	Pieces per Square.	Size in Inches.	Pieces per Square.
6 × 12	533	8 × 16	277	12 × 20	141
7 × 12	457	9 × 16	246	14 × 20	121
8 × 12	400	10 × 16	221	11 × 20	137
9 × 12	355	9 × 18	213	12 × 22	126
7 × 14	374	10 × 18	192	14 × 22	108
8 × 14	327	12 × 18	160	12 × 24	114
9 × 14	291	10 × 20	169	14 × 24	98
10 × 14	261	11 × 20	154	16 × 24	86

The weight of slate per cubic foot is about 174 pounds, or per square foot of various thicknesses as follows:

Thickness in inches.....	1/8	3/16	1/4	3/8	1/2
Weight in pounds.....	1.81	2.71	3 62	5.43	7.25

The weight per square foot of roof tiling, set in iron or between wood rafters ready for slating, is about 12 pounds.

Tin Roofs.

FILE 695.4

Tin roofs should be laid with cleats.

There are two kinds of tin—"bright tin," the coating of which is all tin, that is, the tin proper; and "tern," "leaded," or "roofing" tin, the coating of which is a composition, part tin and part lead. This last will not rust any quicker, but the sulphur in soft coal smoke eats through the "leaded" coating sooner than through the "tinned."

Sizes of tin, 10 by 14 and 14 by 20, and two grades of thickness—IC light, and IX, heavy. For a steep roof (one-sixth pitch or over) the IC 14 by 20 tin ("leaded" if high up where little smoke will get to it; "bright" if low down), put on with a standing groove, and with the cross seams put together with a double lock, makes as good a roof as can be made. For flat roofs IX 10 x 14 "light" is best, laid with cleats, but the others make good roofs and any of them will last twenty-five years at least, if painted periodically.

Number of Square Feet a Box of Roofing Tin Will Cover.—For flat seam roofing, using ½-inch locks, a box of "14 by 20" size will cover about 192 square feet, and for standing seam, using ⅝-inch locks and turning 1¼ and 1½ inch edges, making 1-inch standing seams, it will lay about 168 square feet.

For flat seam roofing, using ½-inch locks, a box of "28 by 20" size will cover about 399 square feet, and for standing seam, using ⅝-inch locks and turning 1¼ and 1½ inch edges, making 1-inch standing seams, it will lay about 365 square feet.

Every box of roofing plates (IC or IX "14 by 20" or "28 by 20" sizes) contains 112 sheets.

For roofs and gutters use seven-pound lead; for hips and ridges, six-pound; for flashings, four-pound.

Gutters should have a fall of at least one inch in ten feet.

No sheet lead should be laid in greater length than ten or twelve feet without a dip to allow for expansion.

Joints to lead pipes require a pound of solder for every inch in diameter.

GRAVEL ROOFING SPECIFICATIONS.

Adopted by the Chicago Master Composition Roofers' Association.

First lay five (5) thicknesses of No. 2 wool roofing felt, weighing not less than fourteen (14) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together, mopping not less than (20) inches between each layer, with best roofing cement, using not less than one-hundred and twenty-(120) pounds of roofing cement to the square of one hundred feet. All joinings along the walls and around the openings to be carefully made. Then cover the entire surface with a coating of roofing cement and screened gravel, using not less than one-sixth (1-6) of a cubic yard of gravel to the square of one-hundred (100) feet. The gravel to be what will pass through not larger than a ⅝ inch mesh screen and to be free from sand and loam.

This roof shall be guaranteed for a period of five (5) years.

N. B.—Over open board construction and all buildings not plastered, use one (1) thickness of rosin sized sheathing paper.

Following are three old standard specifications used in the west for many years.

Five (5) Ply Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred (100) pounds of roofing cement to the square of one hundred (100) feet. All joinings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through ⅝-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Six (6) Ply Cap Sheet Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put four (4) thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than nine (9) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt applied. All joinings along the walls and around the openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through ⅝-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Six (6) Combined Flax and Wool Felt, Composition and Gravel Roof.

First cover the sheathing boards with one (1) layer of dry felt and over this put one (1) layer of flax felt and three thicknesses of wool roofing felt, weighing not less than fifteen (15) pounds (single thickness) to the square of one hundred (100) feet. This felt to be smoothly and evenly laid and well cemented together the full width of the lap, not less than eleven (11) inches between each layer, with best roofing cement, using not less than one hundred and twenty (120) pounds of roofing cement to the square of one hundred (100) feet. The entire surface then to be mopped over with roofing cement and a cap sheet of wool felt applied. All joinings along walls and around openings to be carefully made. The roof to be then covered with a heavy coating of roofing cement and screened gravel, not less than one (1) cubic yard of gravel to six hundred (600) square feet, gravel to be screened through ⅝-inch mesh and free from sand and loam. All walls and openings to be flashed. If not, the rear end of the walls to be flashed not less than fifteen (15) feet from the gutter on each side.

Capacity of Cisterns.

FILE 898

For a circular cistern, square the diameter and multiply by .7854, for the area; multiply this by 1,728 and divide by 231, for number of gallons of one foot in depth; for a square cistern, multiply length by breadth, and proceed as above.

CIRCULAR CISTERN.	SQUARE CISTERN.
5 feet in diameter holds 4.66 bbls.	5 feet by 5 feet holds 5.92 bbls.
6 feet in diameter holds 6.71 bbls.	6 feet by 6 feet holds 8.54 bbls.
7 feet in diameter holds 9.13 bbls.	7 feet by 7 feet holds 11.63 bbls.
8 feet in diameter holds 11.93 bbls.	8 feet by 8 feet holds 15.19 bbls.
9 feet in diameter holds 15.10 bbls.	9 feet by 9 feet holds 19.39 bbls.
10 feet in diameter holds 18.65 bbls.	10 feet by 10 feet holds 23.74 bbls.

Wrought-iron Welded Pipe.

DIMENSIONS, WEIGHTS, ETC., OF STANDARD SIZES FOR STEAM, GAS, WATER, OIL, ETC.

Inside Diameter	Outside Diameter	External Circumference, A	Length of Pipe per Sq Foot of Outside Surface.	Internal Area	External Area.	Length of Pipe containing one Cubic Foot.	Weight per Foot of Length	No. of Threads per Inch of Screw.	Contents in *Gallons per Foot.	Weight of Water per Foot of Length.
In.	In	In.	Ft.	In.	In	Ft	Lbs.			Lbs.
⅛	40	1 272	9.44	012	129	2,500	.24	27	.0006	005
¼	.54	1.636	7.075	049	229	1,385.	42	18	.0026	021
⅜	67	2.121	5.657	110	358	751.5	.56	14	0057	.047
½	84	2 652	4.502	196	554	472.4	84	14	0102	085
¾	1 05	3 299	3 637	441	866	270.	1.12	11½	0230	190
1	1 31	4 134	2 903	785	1.357	166.9	1 67	11½	0408	.349
1¼	1 66	5.215	2 301	1 227	2 164	96.25	2 25	11½	0638	527
1½	1 9	5.969	2.01	1.767	2 835	70.65	2.69	11½	0918	760
2	2 37	7.461	1 611	3.141	4.330	42.36	3.66	8	1632	1.356
2½	2 87	9 032	1 328	4.908	6.491	30.11	5.77	8	2550	2.116
3	3 5	10 996	1 091	7.068	9.621	19 49	7.54	8	3673	3 049
3½	4	12.566	955	9 621	12 566	14.56	9 05	8	.4998	4 155
4	4 5	14 137	849	12.566	15.904	11.31	10.72	8	6528	5.405
4½	5.	15 708	765	15.904	19 635	9 03	12.49	8	8263	6.851
5	5.56	17 475	629	19 635	24.299	7 20	14.56	8	1.020	8.500
6	6 62	20 813	577	28 274	34.471	4 98	18 76	8	1 469	12.312
7	7.62	23 954	505	38 484	45.663	3.72	23 41	8	1.999	16.662
8	8 62	27.096	.444	50.265	58 426	2.88	28 34	8	2 611	21.750
9	9 68	30 433	394	63 617	73.715	2 26	34 67	8	3.300	27 500
10	10 75	33 772	355	78.540	90.792	1 80	40 64	8	4 081	34 000

* The Standard U. S. gallon of 231 inches.

Divide the external circumference column, A, by 12 and the result will be the square feet of surface per lineal foot.

Grade Per Mile.

The following table will show the grade per mile:

An inclination of

1 foot in 15 is 352 feet per mile.	1 foot in 40 is 132 feet per mile.
1 foot in 20 is 264 feet per mile.	1 foot in 50 is 106 feet per mile.
1 foot in 25 is 211 feet per mile.	1 foot in 100 is 53 feet per mile.
1 foot in 30 is 176 feet per mile.	1 foot in 125 is 42 feet per mile.
1 foot in 35 is 151 feet per mile.	

To find quantity of water elevated in one minute running at 100 feet of piston speed per minute: Square the diameter of the water cylinder in inches and multiply by 4. Example: Capacity of a 5-inch cylinder is desired. The square of the diameter (5 inches) in 25, which, multiplied by 4, gives 100, the number of gallons per minute (approximately).

Quantity of Brickwork in Barrel Drains and Wells.

Diameter in Clear	Thickness of Brickwork	Superficial Feet of Brickwork in One Linear Yard.	Number of Bricks Required for One Linear Yard
1 foot, 0 inches	0 feet, 4½ inches	16 feet, 6 inches	115
1 " 6 "	0 " 4½ "	21 " 2 "	148
2 " 0 "	0 " 4½ "	25 " 10 "	181
2 " 0 "	0 " 9 "	33 " 0 "	462
2 " 6 "	0 " 9 "	37 " 8 "	528
2 " 6 "	1 " 1 "	43 " 2 "	906
3 " 0 "	0 " 9 "	42 " 6 "	594
3 " 0 "	1 " 1 "	47 " 10 "	1004
3 " 6 "	0 " 9 "	47 " 1 "	659
3 " 6 "	1 " 1 "	52 " 7 "	1104
4 " 0 "	0 " 9 "	51 " 10 "	725
4 " 0 "	1 " 1 "	57 " 3 "	1203
5 " 0 "	0 " 9 "	61 " 3 "	857
5 " 0 "	1 " 1 "	66 " 9 "	1402
6 " 0 "	1 " 1 "	76 " 1 "	1597
7 " 0 "	1 " 1 "	85 " 6 "	1795

Tests for Pure Water.

Color: Fill a clean long bottle of colorless glass with the water; look through it at some black object. It should look colorless and free from suspended matter. A muddy or turbid appearance indicates soluble organic matter or solid matter in suspension. Odor: Fill the bottle half full, cork it, and leave it in a warm place for a few hours. If when uncorked it has a smell the least repulsive, it should be rejected for domestic use. Taste: If water at any time, even after heating, has a disagreeable taste, it should be rejected.

A simple semi-chemical test is known as the "Heisch test." Fill a clean pint bottle three-fourths full of the water; add a half-teaspoonful of clean granulated or crushed loaf sugar; stop the bottle with glass or a clean cork and let it stand in a light and moderately warm room for forty-eight hours. If the water becomes cloudy, or milky, it is unfit for domestic use.

Capacity of Drain Pipe.

Size of Pipe.	Gallons per Minute.							
	½-in. Fall per 100 ft.	3-in. Fall per 100 ft.	6-in. Fall per 100 ft	9-in. Fall per 100 ft.	12-in. Fall per 100 ft.	18-in. Fall per 100 ft.	24-in Fa'l per 100 ft.	36-in. Fall per 100 ft.
3-inch	21	30	42	52	60	74	85	104
4 "	36	52	76	92	108	132	148	184
6 "	84	120	169	206	240	294	338	414
9 "	232	330	470	570	660	810	930	1140
12 "	470	680	960	1160	1360	1670	1920	2350
15 "	830	1180	1680	2040	2370	2920	3340	4100
18 "	1300	1850	2630	3200	3740	4600	5270	6470
20 "	1760	2450	3450	4180	4860	5980	6850	8410

Table showing the velocity of discharge of different sized sewers.

Diam. of pipe.	180 feet per minute, 3 feet per second.		270 feet per minute, 4½ feet per second.		360 feet per minute, 6 feet per second.		540 feet per minute, 9 feet per second.	
Inches.	Fall.	Gallons per minute.	Fall.	Gallons per minute.	Fall.	Gallons per minute	Fall.	Gallons per minute.
3	1 in 69	54	1 in 30.4	81	1 in 17.2	108	1 in 7.6	162
4.....	1 in 92	96	1 in 40.8	144	1 in 23.	192	1 in 10.2	288
6.....	1 in 138	216	1 in 61.2	324	1 in 34.5	432	1 in 15.3	648
9.....	1 in 207	495	1 in 92.	742.5	1 in 51.7	990	1 in 23	1,485

Hot-Water and Steam Heating—Overhead System.

FILE 697.41

In using steam for the heating of high buildings, it is necessary to use the overhead plan, unless some automatic system of expelling the air is adopted. It requires less power to force the air through the standpipe than it would through a large number of risers. The air is forced out on the descent of the steam, and less fuel and power are necessary.

The overhead hot-water system is coming into general use, as it can be put in so that the farthest radiators in a building will heat at the same time as those nearer the boiler, and the result will also be felt in rooms in the basement—the principle of the siphon causing the effect.

The pipes from the main in the attic, from which the several branches are taken, can be pitched so that heat in the several parts of a building will result as quickly as desired; either an open or closed tank can be used. The pipes exposed in attic should be covered. Opinions vary as to the sizes of pipe to be used.

List of Sizes of Steam Mains.

FILE 697.42

To determine the size of pipes no fixed rule can be given which will apply in all cases. A rule that has generally been accepted by steam fitters as good practice, is to allow the area of a one-inch pipe (.7854 square inches) for every 100 square feet of radiating surface, including mains.

BOILER EFFICIENCY TABLE

Based on evaporation from and at 212° F.

B. T. U. Per Lb. Coal.	50% Efficiency		55% Efficiency		60% Efficiency		65% Efficiency		70% Efficiency		75% Efficiency		80% Efficiency	
	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.	Evaporation Per Lb. Coal.	Lbs. Coal Per H. P. Hour.
7500	3.8	9.0	4.2	8.2	4.6	7.5	5.0	6.8	5.4	6.4	5.8	6.0	6.2	5.5
8000	4.1	8.4	4.5	7.6	4.9	7.0	5.3	6.5	5.7	6.0	6.2	5.5	6.6	5.2
8500	4.4	7.8	4.8	7.1	5.2	6.6	5.7	6.0	6.1	5.6	6 6	5 2	7.0	4.9
9000	4.6	7.5	5.1	6.7	5.5	6.2	6.1	5.5	6.5	5.3	6.9	5.0	7.4	4.6
9500	4.9	7.0	5.4	6.3	5.9	5.8	6.3	5.4	6.8	5.0	7.3	4.7	7.8	4.4
10000	5.1	6.7	5.6	6.1	6.2	5.5	6.7	5.1	7.2	4.7	7.7	4.4	8.2	4.2
10500	5.4	6.3	5.9	5.8	6.5	5.3	7.1	4.8	7.6	4.5	8.1	4.2	8.6	4.0
11000	5.6	6.1	6.2	5.5	6.8	5.0	7.4	4.6	7.9	4.3	8.5	4.0	9.1	3.7
11500	5.9	5.8	6.5	5.3	7.1	4.8	7.7	4.4	8.3	4.1	8.9	3.8	9.5	3.6
12000	6.2	5.5	6.8	5.0	7.4	4.6	8.0	4.3	8.6	4.0	9.3	3.7	9.9	3.4
12500	6.4	5.3	7.1	4.8	7.7	4.4	8.4	4.1	9.0	3.8	9.7	3.5	10.3	3.3
13000	6.7	5.1	7.4	4.6	8.0	4.3	8.7	3.9	9.4	3.6	10.0	3.4	10.7	3.2
13500	6.9	5.0	7.6	4.5	8.3	4.1	9.0	3.8	9.7	3.5	10.4	3.3	11.1	3.1
14000	7.2	4.7	7.9	4.3	8.6	4.0	9.4	3.6	10.1	3.4	10.8	3.2	11.5	3.0
14500	7.5	4.6	8.2	4.2	9.0	3.8	9.7	3.5	10.5	3.2	11.2	3.0	12.0	2.8

SPACE OCCUPIED BY FUEL.

Coals of the same size coming from different mines vary in density, but the space given below is an average for best fuels:

Stove Anthracite	33	cubic feet per 2,000 lbs.
Egg Anthracite	32.5	cubic feet per 2,000 lbs.
Soft Coal	40	cubic feet per 2,000 lbs.
Coke	68	cubic feet per 2,000 lbs.

Transmission of Heat by Various Substances.

FILE 697 ó

Window glass being	1,000
Oak or Walnut	.66
White Pine	.80
Pitch "	.100
Lath and Plaster	.75 to 100
Brick (rough)	.200 to 250
" Whitewashed	.200
Granite or Slate	.250
Sheet Iron	.1030 to 1110

Table Showing Amount of Glass Surface which may be Heated by 1 Square Foot of Radiating Surface in Good Buildings.

	Hot Water.			Steam.	
Temperature of radiating surface (radiators) Fahr	160°	180°	200°	227° 5 Lbs.	240° 10 Lbs.
	Square Feet of Glass to 1 Square Foot Radiator Surface.				
Temperature above surrounding air 90°	1.9	2.3	2.8	3.3	3.8
" " " " 80°	2.3	2.9	3.5	4.0	4.6
" " " " 70°	3.0	3.6	4.2	5.0	5.7
" " " " 60°	4.0	4.6	5.25	6.0	7.0
" " " " 50°	5.0	6.0	6.8	8 0	9.0
" " " " 40°	6.9	8.0	8.2	10.0	11.5

Formulae for Figuring Radiation for Factories.

A formula for figuring radiation which is used by some of the best heating engineers in determining the amount of radiation for factory buildings is as follows: $\frac{G}{3.3} + \frac{W}{10.9} + \frac{V}{171}$ = sq. ft. of radiation in which, G = Glass Area.
W = Net Wall Area.
V = Volumn of air in the Room.

Another formula also widely used in figuring radiation for factory buildings is as follows: $\left(\frac{G}{1} + \frac{W}{4} + \frac{V}{55}\right)$ x Dif. in Temp.) ÷ 400 = sq. ft. Rad in which the letters represent the same quantities as above.

Proportion of Parts of Steam Heating Boilers.

FILE 697 43

From Prof. R. C. Carpenter.

Radiating surface=square feet	250	500	750	1000	1500	2000	3000	4000	5000	7500	10000
Nominal horse-power	2.5	5.0	7.5	10.0	15.0	20.0	30.0	40.0	50.0	75.0	100.0
Ratio radiating to heating surface	4.5	5.1	5.4	5.6	6.0	6.2	6.7	6.9	7.0 9.0*	7.0 9.0*	7.0 9.0*
Probable evaporation per lb. coal	5.5	5.7	6.0	6.5	7.0	7.5	8.0	8 5	9.0	9.5	10.0
Pounds of steam per sq. ft. grate (A)	55.0	57.0	60.0	65.0	70.0	75.0	80.0	85.0	90 0	95.0	100.0
Pounds of steam per sq. ft. grate (B)	44.0	46.0	48.0	52.0	56.0	60.0	64.0	68.0	72.0	76.0	80.0
Ratio radiating to grate surface (A)	165.0	171.0	180.0	195.0	210.0	225 0	240.0	255.0	270.0	285.0	300.0
Ratio radiating to grate surface (B)	132.0	138.0	144.0	156.0	168.0	180.0	192.0	204 0	216.0	228.0	240.0
Ratio heating to grate surface (A)	36.5	33.2	33.2	34.8	35.0	36 2	36.5	37.0	38.5	40.5 31.5*	42.5 33.3*
Ratio heating to grate surface (B)	28.5	27.0	26.7	27.7	28.0	29.0	29.3	29.6	30.8	32.2 25 2*	34.5 26.5*
Heating surface, square feet	55.0	98.0	138.0	178.0	250.0	322.0	447.0	580.0	710.0	1071 833*	1430 1111*
Grate surface, square feet (A)	1.52	2.92	4.15	5.68	7.15	8.9	12.4	15.7	18.5	26.5	33.3
Grate surface, square feet (B)	1.88	3.88	5.4	6.37	8.92	11.2	15.5	19.5	23.2	32.5	41.5
Diameter of safety valve, inches	1.5	2.25	2.50	2.75	3.0	3.25	3.5	4.2	4.0	2 of 3	2 of 4
Diameter of smoke flues, inches	7.0	10.0	11.2	12.0	15.0	17.0	19 0	23.0	25.0	28	3A
Square inches in above flues	38.5	78.5	95.0	113.0	176.7	227.0	283.5	415.5	490 9	615.7	907.9

*Water tube boilers.

A When rate of coal consumption is 10 pounds per hour each square foot grate surface.

B When rate of coal consumption is 8 pounds per hour each square foot grate surface.

Rules for Calculating Speed of Pulleys.

I.—The diameter of the driver and driven being given, to find the number of revolutions of the driven:

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions.

II.—The diameter and the revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time:

Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of revolutions of the driven; the quotient will be its diameter.

III.—To ascertain the size of the driver:

Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make, and divide the product by the revolutions of the driver; the quotient will be the size of the driver.

Belts.

Leather belts must be well protected against water, and even moisture.

India-rubber is the proper substance for belts exposed to the weather.

It is desirable to run the grain (hair) side of leather belts on the pulley, in order that the strongest part of the belt may be subject to the least wear.

Leather belts run with grain side to the pulley will drive thirty per cent more than if run with flesh side. The belt, as well as the pulley, adheres best when smooth, and the grain side adheres best because it is smoothest.

The transmitting power of a double belt is to that of single belt as 10 is to 7. In ordering pulleys, the kind of belt to be used should always be specified.

Belts should be kept soft and pliable. For this purpose blood-warm tallow, dried in by heat of fire or the sun, is advised. Castor-oil dressing is also good.

The motion of driving should run *with* and not *against* the laps of the belts.

If too great a distance is attempted, the weight of the belt will produce a very heavy sag, drawing so hard on the shaft as to produce great friction in the bearings, while at the same time the belt will have an unsteady, flapping motion, which will destroy both the belt and machinery.

If possible to avoid it, connected shafts should never be placed one directly over the other, as in such case the belt must be kept very tight to do the work. For this purpose belts should be carefully selected of *well-stretched* leather.

It is desirable that the angle of the belt with the floor should not exceed 45 degrees. It is also desirable to locate the shafting and machinery so that belts should run off from each shaft in opposite directions, as this arrangement will relieve the bearings from the friction that would result when the belts all pull one way on the shaft.

The diameter of the pulleys should be as large as can be admitted.

The pulley should be a little wider than the belt required for the work.

When it is not convenient to measure with the tape line the length required, apply the following rule: Add the diameter of the two pulleys together, divide the result by 2, and multiply the quotient by 3¼, then add this product to twice the distance between the centers of the shafts, and you have the length required.

The width of belt needed depends on three conditions: 1. The tension of the belt. 2. The size of the smaller pulley, and the proportion of the surface touched by the belt. 3. The speed of the belt.

The working adhesion of a belt to the pulley will be in proportion both to the number of square inches of belt contact with the surface of the pulley and also to the arc of the circumference of the pulley touched by the belt. This adhesion forms the basis of all right calculation in ascertaining the width of belt necessary to transmit a given horse-power.

ESTIMATES ON PAINTING.

By EMERY STANFORD HALL, B. S.

PAINTER'S ESTIMATE=(units of surface to be covered) × (amount of material required to cover a unit) × (cost of a unit of material) + [(number of hours of labor required by a mechanic to apply the material to a single unit of surface) × (hourly wage of mechanic) × (number of units of surface)] + (overhead charges, including scaffolding, brushes, drop-cloths, cartage, office expense and expense of supervision, etc.) + (Contractor's profit, which varies with the supply and demand).

UNITS OF SURFACE USED ARE (one sq. ft.), (sq. yd. = 9 sq. ft.) or (square = 100 sq. ft.).

AMOUNT OF SURFACE UNITS assumed for estimating purposes are increased at the judgment of the estimator. This is done to make proper allowance for increased labor and waste of material on account of broken and complicated surfaces, and so that prices per unit of labor and material can be maintained constant, the following enumerations being the assumptions most commonly used by estimators:

PLAIN D. & M. Wainscoting or partition stuff is measured once, actual surface, and is used as the standard of comparison. Other surfaces are increased in proportion as their difficulty of execution compares with D. & M. Wainscoting.

Sash for exterior are measured over the entire area instead of around each bar.

Shingle Gable, 1½ × actual surface area.

Dormer Windows 2 × actual surface area.

Shingles, Rough, 1½ to 2 × actual surface area.

Shingles, Dressed, Dimension, actual surface measure.

Spindle work, measure 4 times solid on one side.

Square Spindle work and pickets, 4 × one side measured solid.

Verandas with heavy columns and railings, etc., measure surface of ceiling and floors and all sides the same as though enclosed veranda. Very simple in design, measure floor and ceiling and allow double area of brackets and columns.

Outside Blinds, measure 3 × actual surface of one side.

INTERIOR.

Base Boards, measure not less than 1 foot in width regardless of actual width.

Picture Mouldings, measure 1-3 foot in width.

Single Doors, including trim, count as 35 sq. ft. to a side or 70 sq. ft. for both sides.

Interior Side of Windows, including trim and tracing of sash, average at 35 sq. ft.

Wall Decorations, measure ceiling solid and sidewalls 8-10 of actual area to allow for openings, or measure actual area and deduct ½ to ⅔ of all openings.

Badly Weathered wood work or cracked and damaged plaster, add from 1-10 to 3-10 to measurements determined as above.

MATERIALS, COVERING POWER OF.

White Lead Paste averages to contain by bulk 92% dry lead pigment and 8% linseed oil and weighs about 38.1206 lbs. to the gallon of bulk.

Carbonate of Lead = chemically to Pb OCO_2, was the lead formerly used in paints as a pigment. The fumes of this preparation of lead are poisonous and workmen have to be very careful in handling this material to avoid soiling hands or inhaling fumes from the same.

Sublimed Lead or Basic Lead Sulphate = chemically to $PbSO_4$, is coming into general use for paints and is practically non-poisonous and just as valuable as a pigment.

Linseed Oil weighs about 7½ lbs. to the gal. of bulk.

Turpentine weighs about 7 lbs. to the gal. of bulk.

Primer of Lead and Oil for new work should be proportioned by bulk, so as to contain 27% of White Lead Paste, 62% of Linseed Oil and 11% of Turpentine.

Priming Lead and Oil will require 10.3 lbs. White Lead, .62 gal. Linseed Oil and .11 gal. Turpentine to make one gal. of paint.

One Gallon Lead and Oil Primer will average to properly cover about 2¾ squares of new wood work or 1¼ squares of common brick work.

One Square of New Wood Work requires to properly prime same with lead and oil 3¾ lbs. White Lead, .23 gal. Linseed Oil and .04 gal. Turpentine, or if common brick requires 8.24 lbs. White Lead, .5 gal. Linseed Oil and .088 gal. Turpentine.

Succeeding Coats of Lead and Oil Paint after primer should be proportioned by bulk so as to contain 30% White Lead, 64% Linseed Oil and 6% of Turpentine.

Succeeding Coats of Lead and Oil Paint after priming will require 11.44 lbs. White Lead Paste, .64 gal. Linseed Oil and .06 gal. of Turpentine to the gal.

One Gallon Lead and Oil Succeeding Coater will average to properly cover, any coat, about 4½ squares of wood work after same has been primed, or 3 squares of common brick work, second coat. Third coat on brick work, one gal. will cover as much surface as on wood.

One Square of Any Oil Succeeding Coat on wood work after same has been primed will average to require to properly cover same 2.54 lbs. White Lead, .14 gal Linseed Oil and .0133 gal. of Turpentine; or for 2nd coat on common brick work, 3.48 lbs. White Lead, .21 gal. Linseed Oil and .02 gal. of Turpentine. (Third coat on brick work will require the same amount of paint to unit of surface as "Succeeding Coats" on wood.)

Paste Filler for open grained hard-wood finish or floors requires for proper filling and wiping 1⅔ lbs. Silex paste and .14 gal. thinner to the square.

Wiping of paste filler is done with burlap, sea moss or excelsior and should always be done across the grain of the wood as if rubbed with the grain of the wood there is a tendency to lift the filler out of the pores of the wood and waste same, requiring more filler to give satisfactory results.

Thinner for paste filler may be either Turpentine or Benzine if the filler is of best quality of rock quartz, water floated, very finely bolted and mixed with special Japans and Linseed Oil. Benzine seems to give the most satisfactory results for a thinner owing to its quicker evaporation. For the cheaper fillers Turpentine must be used.

Paste Filler is tinted or left transparent according to the color effect desired.

Stains for wood work usually form one coat in addition to filler and coats of varnish or wax; these are of three kinds, oil-stain, spirit-stain and water-stain, and are used according to the effect desired.

Oil-Stain averages to require about .16 gal. to the square.

Spirit-Stain averages to require about .16 gal. to the square.

Water-Stain averages to require about .2 gal. to the square.

Prepared Wax averages to require about .33 lbs. to the square.

Varnish, Best Light Interior, requires for properly coating one square, 1st coat over filler, 1-5 to 1-7 gal.

Varnish, Cheap, Thick Rosin, requires for coating one square one gloss coat, ¼ to 1-5 gal.

Creosote Stain required to dip ⅔ length one M. shingles equals about 2¾ gal.

Creosote Stain required to brush coat one square shingles equals one gal.

Oil Paint to cover one square metal work, one coat requires about 1-10 gal.

Prices of standard materials are quoted in market reports and fluctuate with supply and demand. The estimator should verify these preceding each estimate. At time of going to press the following prices obtain:

White Lead Paste, 6¾c per lb.

Linseed Oil, 54c per gal.

Turpentine, 56c per gal.

Paste Filler, about 10c per lb. in 100-lb. packages or 8½c in bbls.

Interior Varnishes, about $2.00 per gal.

Stains vary so much in price that they can not be listed.

First Class Exterior Varnishes, about $3.50 per gal. (It should be explained that owing to the slow drying or hardening qualities of best exterior varnishes, a cheaper and less durable grade is usually used, costing about $2.50 per gal.)

Proprietary Oil Paints of best quality are sold to the painters at about $1.50 per gal., depending on color. The materials in a gal. of White Lead and Linseed Oil "Succeeding Coat" of paint costs exclusive of labor and coloring matter about $1.14 at present market prices and the labor of mixing by hand and the expense for colors brings this hand-mixed paint up in price to about the same as proprietary paints of equal quality. Unless the ingredients composing paint are thoroughly incorporated the paint is not satisfactory. This proper mixing, if done by hand, requires considerable expensive labor.

Chemical action between the pigments and oil in paint ordinarily does not occur, but there are exceptions. Sabin states that such action takes place with White Lead and Linseed Oil, "probably between the oil and the lead hydrate, which constitutes at least a quarter of the pigment." "This change is said to be due to resinification of the oil converting into a sort of varnish." "Zinc Oxide (White Zinc) also acts on oil, but in a much less degree." "Paint consisting of White Lead and White Zinc mixed together in the proportions of two of lead to one of zinc is reputed to be superior to either alone. Zinc brushes more readily, but will cover less surface than White Lead."

Linseed Oil is the only known universally successful binder for paint and the holding power of the paint depends almost entirely on the strength of the linseed oil used. This oil is adulterated in many ways, but the most common is with mineral oil. The manufacturers of mineral oil substitute have perfected their product to such an extent that it is difficult to distinguish it from the real article except by chemical test or actual use, when its inferiority is quickly manifest.

LABOR REQUIRED.

COST OF LABOR = (number of hours of labor required by a mechanic to apply the material to the single unit of surface) × (hourly wage of mechanics) × (number of units of surface).

Wage per Hour = union scale obtaining in the locality where the work is to be executed. (In Chicago, this is 60c per hour under an agreement expiring April 1st, 1909.)

Stopping knots with shellac requires in labor .2 of an hour's time to the square of surface.

Puttying defects in ordinary wood work requires in labor .3 of an hour's time to the square of surface.

Oil painting, single coat, requires in labor .57 of an hour's time to the square of surface.

Paste Filler Coat, including cleaning of wood work, requires in labor 1.33 hours' time to the square of surface.

Varnish, single coat, including light sandpapering, requires in labor .66 of an hour's time to the square of surface.

Creosote staining of shingles by ⅔ dipping, requires in labor 1 hour of a mechanic's time to dip 1,000 shingles, which average to cover when laid, one square of roof surface.

Creosote staining, one brush coat on roof, requires in labor .8 hour's time to cover one square of surface.

Sizing of plaster walls with either glue or hard oil size requires in labor .33 of an hour's time to the square of surface.

Tinting with water color, fresco tints or calcimine averages to require in labor .44 hour's time to the square of surface to the man employed, providing not less than two men are employed on the work. (Ordinarily, one man cannot work alone at tinting of walls, for if he does so work, the work cannot be satisfactorily done and more time is required in proportion to the surface covered.)

Sponging and washing walls requires in labor a variable amount of time to the square according to the amount of size used in coat to be removed and must be approximated by the estimator after examination and test.

ILLUSTRATIVE CHARGES FOR CONTRACT WORK.

The following items illustrate some of the average charges made by contractors for material and labor at the time of going to press:

Whitewashing (machine applied) including material, labor and contractor's profit, about 25c per square, varying according to the size of the job, sometimes, in case of very large jobs, being figured as low as 8½c.

Whitewashing (hand brush applied), including material and labor and contractor's profit, about 50c per square.

Painting, two coat work, is estimated as worth $2.25 per square; itemized, 50c for all material and $1.75 for labor and profit.

Varnish work, including one coat of paste filler and two coats of varnish, is worth about $2.50 per square.

Sizing walls is worth about 75c per square for hard oil size.

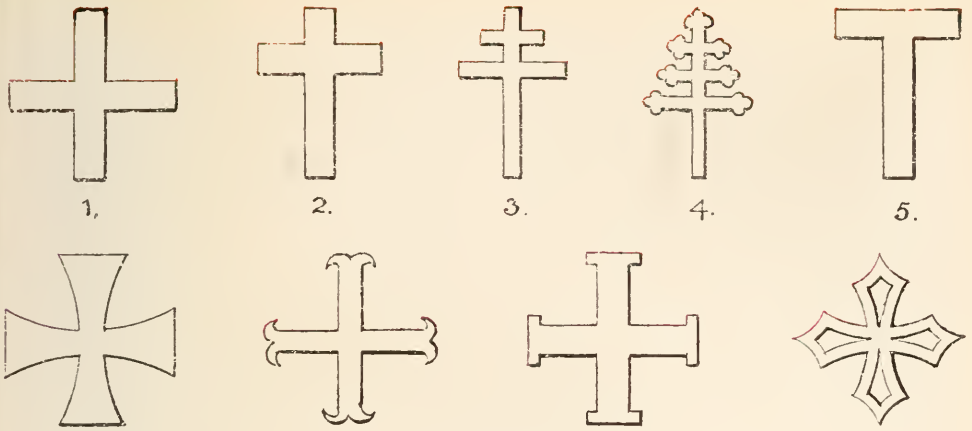
Tinting walls, depending on color, averages to be worth 80c per square.

FIXED CHARGES.

The expenses of conducting the painting contracting business vary according to the efficiency of organization and range from 25 to 35 per cent of the cost of executing the work.

THE ESTIMATE.

After surfaces are measured and materials and labor are priced, as described above, and items totalled, about 30 per cent should be added to cover fixed charges and a percentage for profit, varying according to the reputation of the contractor, which will give the probable contract price of the work.



CROSSES.

The cross, a symbol of Christianity, has very naturally been extensively used in the monuments of the middle ages. When the two branches of the cross are equal in length, as in Fig. 1, the cross is called a Greek cross, and when the stem is longer than the arms, as in Fig. 2, it is a Roman or Latin cross. When the figure has two arms, one longer than the other, as in Fig. 3 (the upper one meant as a representation of the inscription which was placed over the head of Christ) it is known by the name of the Lorraine cross, and has received that name from its being a bearing in the arms of the Dukes of Lorraine. By heralds this is called a patriarchal cross. The next cross, whose arms are triple, as Fig. 4, is the papal cross, and is one of the emblems of the papacy, signifying, perhaps, like the triple crown or tiara, the triple sovereignty over the universal church, the suffering church and the triumphant church. The great majority of the western churches, with transepts, are constructed in the form of the Latin cross, those in the form of the Greek cross being very rare. Those in the form of the Lorraine cross are still rarer, and rarer are those constructed with triple transepts. There is another form called the truncated or tau cross, as Fig. 5, having the form of that letter, on which, as a plan, a few churches have been built. Considered as respects the contour, the cross in blason has been variously shaped and named. Thus, Fig. 6, in which the extremities widen as they recede from the center, is called a cross patee. This is met with more frequently than any of the others. It is seen in the nimbus, on tombs, on shields, upon coins, etc.; and is the usual form of the dedication cross found in religious structures. Fig. 7 is by the French called ancree, the extremities forming hooks, but by heralds it is called the cross moline. Crosses flory are those in which the ends are formed into trefoils, as is seen in Fig. 4, the papal cross above mentioned. Fig. 8 is a cross potent, and Fig. 9 is the cross clechee, as respects the outer lines of its form; when it is voided, as shown by the inner lines, the ground or field is seen on which it lies.

SYMBOLS FOR THE APOSTLES.

From the constant occurrence of symbols in many cathedrals of the present day, the following list may be found useful:

PETER—Bears a key, or two keys with different wards. ANDREW—Leans on a cross so called from him; called by heralds the saltire. JOHN THE EVANGELIST—With a chalice, in which is a winged serpent. When this symbol is used, the eagle, another symbol of him, is never given. BARTHOLOMEW—With a flaying-knife. JAMES THE LESS—A fuller's staff bearing a small square banner. JAMES THE GREATER—A pilgrim's staff, hat, and escalop-shell. THOMAS—An arrow, or with a long staff. SIMON—A long saw. JUDE—A club. MATTHIAS—A hatchet. PHILIP—Leans on a spear or has a long cross in the shape of a T. MATTHEW—A knife or dagger. MARK—A winged lion. LUKE—A bull. ST. JOHN—An eagle. PAUL—An elevated sword or two swords in saltire. JOHN THE BAPTIST—An Agnus Dei. STEPHEN—With stones in his lap.

THE ORDERS AND THEIR APPLICATION.

By ALFRED W. S. CROSS, M. A., F. R. I. B. A , and ALAN E. MUNBY, M. A.

THE SETTING UP OF AN ORDER.

(To be studied in connection with Plates I., II., III., IV. and V.)

The sequence followed in setting up an Order will be found to influence, to some extent, the rapidity and facility with which it can be accomplished. An outline of the method of procedure may, therefore, prove useful.

Usually the height of the Order is fixed by circumstances, as, for example, when it is to be applied to a given story of a building.

The total height having been settled, draw the limiting horizontal lines and then set out the vertical centre lines of the columns, thus dividing the frontage to be treated into bays appropriate to the exigencies of the design and having due regard to the correct intercolumniation of the Order adopted. If a pedestal is to be placed under the column, cut off one-fifth of the total height for it, and cut off one-fifth or one-sixth of the remainder (measured from the top limiting horizontal line) for the vertical height of the entablature; the intervening space gives the height of the column, including its cap and base. If no pedestal is to be used, divide the whole of the given height into five or six parts, cut off one of these parts, from the top, for the entablature, and the remainder gives the height of the column.

The Column. Since some of the dimensions of the entablature are in terms of the diameter of the column, the latter should be next developed. The term "diameter of the column" refers always to its greatest diameter—namely, that of the shaft just above the lower cincture. This dimension is one-seventh to one-tenth of the height between the soffit of the entablature and the top of the pedestal, or lower limit of the Order in the absence of a pedestal. If the centre lines of the piers do not represent the centres of the columns, as, for instance, when coupled columns are used, the centre line of one of the columns must now be decided upon and the diameter of the Order symmetrically disposed horizontally across it. A semi-diameter is then cut off, from the bottom of the column, for the height of the base, and it should be noticed that this—except in the Tuscan and alternative Doric Orders—does not include the fillet at the base of the shaft, the members above the upper torus being reckoned as part of the shaft, as are also the astragal and fillet below the necking of the capital of the column. The plinth and lower torus of the base project one-third and the upper torus one-fifth of a semi-diameter beyond the lower circumference of the shaft. The leading lines for the base having thus been obtained, cut off by a horizontal line the height of the capital from the top of the column, and (except in the Ionic Order) again below it, a height equal to one-sixth of a semi-diameter for the astragal and fillet below the necking.

The semi-diameter of the shaft at one-third of its height from the bottom is then divided into five or six parts, and four or five of these parts are taken as a semi-diameter at the top, below the astragal. The shaft may now be completed, the entasis being usually made to start from the greater diameter, one-third up the shaft, below which point it is a true cylinder until the cincture at the base is reached. This is the best method to adopt in the case of small scale drawings. Where large detailed drawings are in question the diameter may be alternatively divided at the base of the shaft instead of at one-third of its height, and the entasis extended throughout the whole length. The completion of the shaft enables the projection of the capital to be marked off, and also that of the astragal and fillet, which is equal to their combined height.

The Entablature. The development of the entablature can now be proceeded with, the architrave, frieze and cornice being ruled off horizontally and the members of each inserted (see dimensions). The projections for a returned end or section are obtained from the upper diameter of the shaft. The lowest member of the architrave, and also the frieze, lie vertically over the circumference of this upper end of the shaft. The projection of the cornice beyond the frieze line is equal to its height, except in the Doric Order, in which the projection is one-third more than its height of one diameter. Further rules dealing with minor projections and the position of the modillions, dentils, etc., will be supplied by a study of the plates and tabulated dimensions.

Pedestal. Finally, the pedestal, if any, should be divided vertically into four parts; the lower part is ruled off for the height of the plinth, one-third of the second part for the height of the base, and one-half of the top part for that of the cap. The projection of the die is equal to that of the base of the column, and the plinth and the cap of the pedestal extends beyond this for a distance equal to the height of the base of the pedestal previously obtained.

The above dimensions will all be found in the subjoined table, which represents an endeavour to bring together, in a form suitable for reference, sufficient information to make any glaring disproportion impossible.

A few of the minor divisions are only approximations; they will, however, be found to be sufficiently accurate for any but large detail drawings, in which it is not desirable to destroy all individuality by rigorous mechanical rules.

On the left hand will be found the dimension required and, in the intermediate column the fraction for each Order of the previously ascertained unit given in the right-hand column.

Plate I.

Plate I. represents the four Orders drawn to a common vertical height.

The pedestal may or may not be required and, if used, it is to be regarded as an addition to the Order, the relative dimensions of the parts of which are not altered by its removal or introduction.

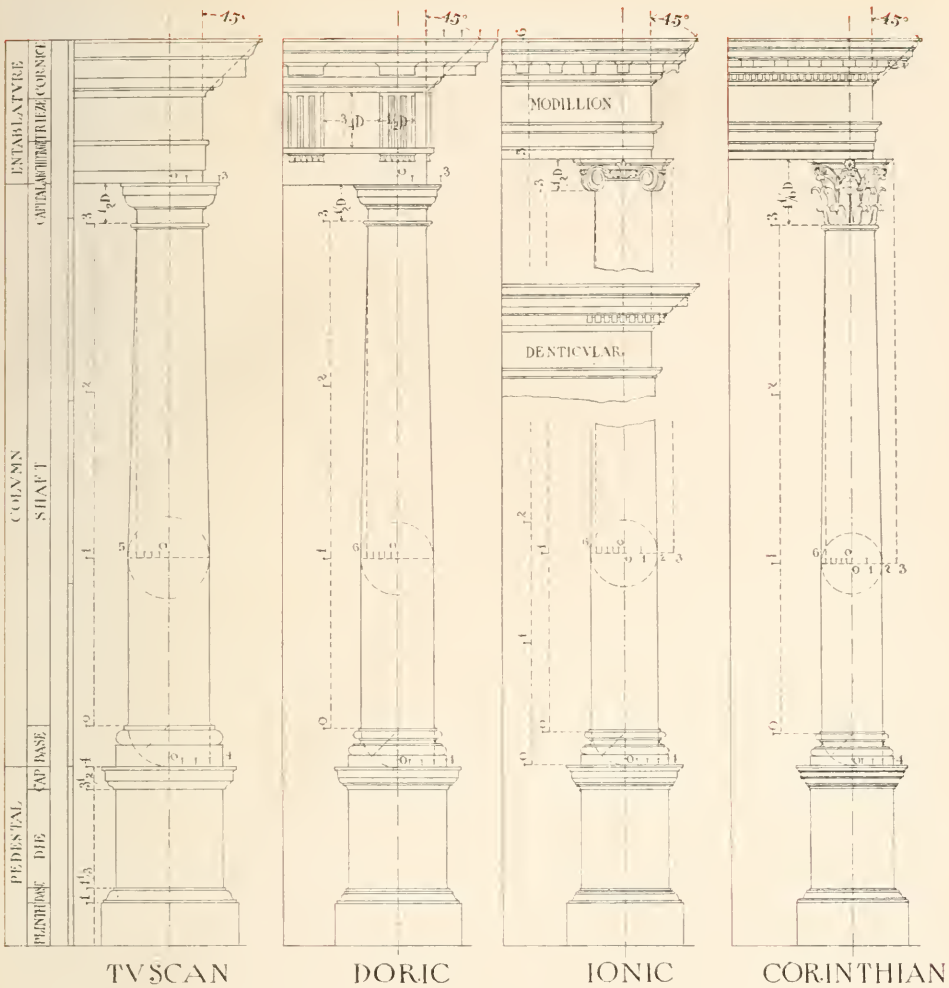
The diameter of the column (by which is meant the diameter of the shaft following its lower cincture) is the ruling dimension from which most of the others are obtained, and the smaller circumference of the top of the shaft always coincides with the frieze line from which all the projections of the entablature are set out.

In judging the value of such projections it should be borne in mind that in execution the higher vertical faces of the composition will usually be much foreshortened to the observer and that there will be a consequent increase in the comparative value of neighboring projections.

A perusal of the table will indicate those dimensions which all the Orders have in common, but for convenience of reference they are further summarized thus:

Height of Pedestal, ⅓ total height of Order.

PLATE 1.



Height of Plinth, ¼ height of Pedestal.

Height of Pedestal Base, ⅓ height of Pedestal Plinth.

Height of Pedestal Cap, ½ height of Pedestal Plinth.

Projection of Cap and Plinth, ⅓ height of Pedestal Plinth.

Projection of Corona over Die, ¾ projection of Pedestal Cap.

Height of Column Base, ½ dameter of Column.

Projection of Base over Shaft, ⅓ semi-diameter of Column.

Pilasters. The general proportions allotted to the columns of the Orders apply also to pilasters, which may be regarded as columns square on plan, but almost universally deeply engaged. The projection of pilasters must be regulated by circumstances. If impost mouldings or other projections stop upon them, as on the inner wall of an arcade, these projections must be sufficient to take the mouldings, and if they line with engaged columns crowned by an entablature, they must have a projection similar to the columns, and therefore in such cases never less than a semi-diameter. Apart from these considerations, the projection should be about one-fourth of the diameter. Pilasters may be fluted or plain; if the former, the flutes should be, as far as possible, the same size as those of the adjoining columns, and always an odd number.

* * *

On plain faces 7 flutes (occasionally 9) are used, and therefore in the above case 4 flutes (or 5) would be employed on each side of the re-entering angle. The returned sides of pilasters should never be fluted unless the projection is as much as half of a diameter. The diameter assigned to a pilaster will be that of a column (if any) used in conjunction with it. The shaft may or may not be diminished.

If the pilaster stand alone it is best formed with the same top and bottom diameter, but if a column stand in front of it then it should be diminished to the same extent as the column. Entasis is not usually given to pilasters.

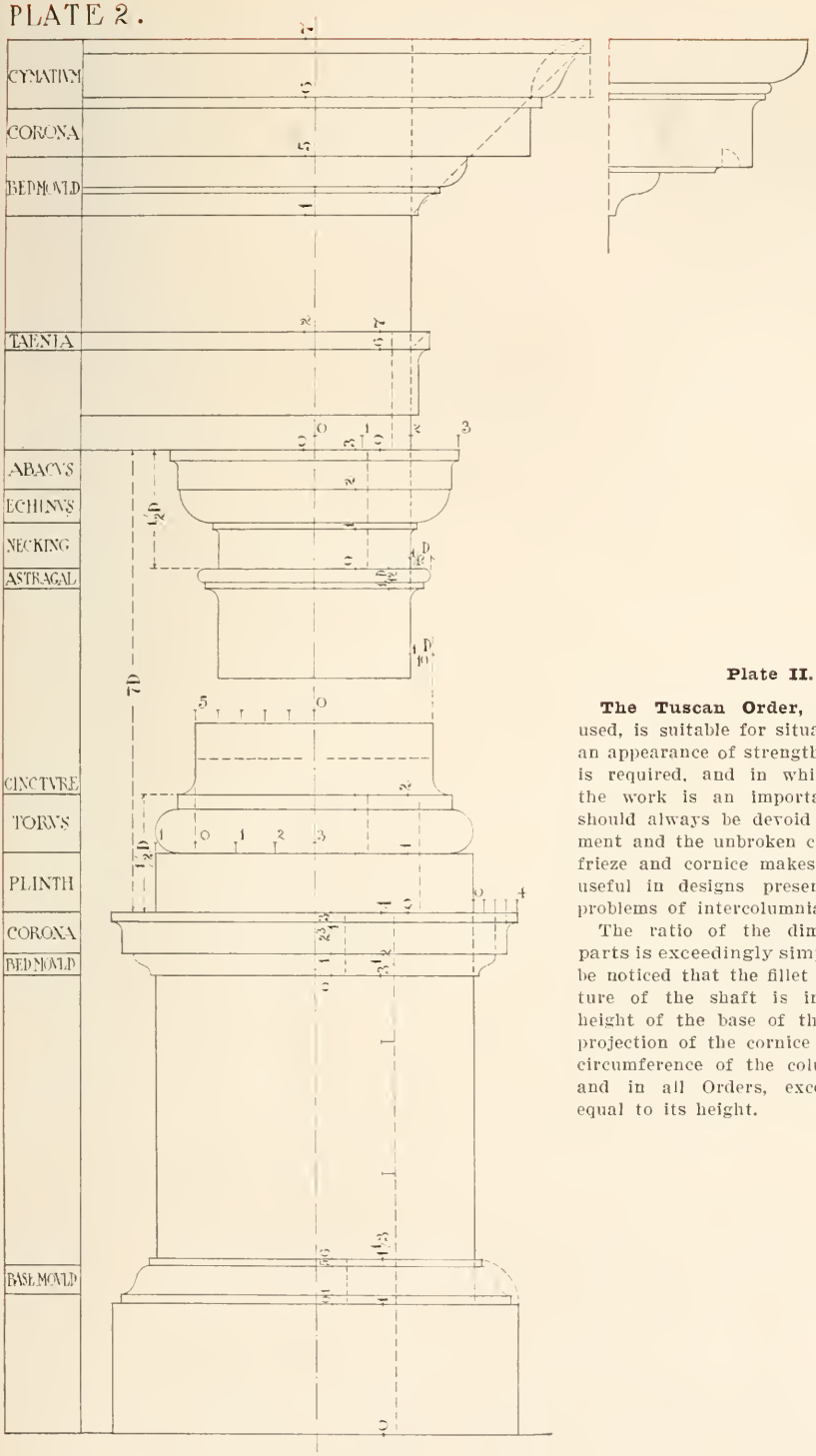
Unless columns and pilasters are monoliths the shafts should be built up of three drums and not two, as a central joint, unless exceptionally well executed, has a very disagreeable appearance.

"Practical Notes for Architectural Draughtsmen: The Orders and their Application."
Tabulated Dimensions of the Orders. Arranged Progressively as Required for Use.

Dimension required.	Tuscan.	Doric.	Ionic.	Corinthian.	Dimension = 1.
No Pedestal — Height of Entablature	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	Total height of Order.
With Pedestal — Height of Pedestal	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	" " "
With Pedestal — Height of Entablature	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	Height of Order less Pedestal.
THE COLUMN.					
Vertical. Diameter of Shaft	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{10}$	Height of Order less Entablature and Pedestal.
Vertical. Height of Base	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	Diameter of Shaft.
Vertical. " Base Plinth	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{3}$	Height of Base.
Vertical. " Lower Torus	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{10}$	" " less Plinth.
Vertical. " Upper Torus	—	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{5}{8}$	" lower Torus.
Vertical. " Upper Torus and fillet under	—	1	1	1	" " "
Vertical. " Capital	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{6}$	Diameter of Shaft.
Vertical. " Necking	$\frac{1}{3}$	$\frac{1}{3}$	To eye $\frac{1}{5}$ Eye to abacus	To 1st leaf about $\frac{1}{5}$	Height of Capital (Corinthian less Abacus).
Vertical. " Top of Neck to top of Ovolo	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	To 2nd leaf about $\frac{1}{3}$	" " " " "
Vertical. " Abacus	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	2nd leaf to abacus about $\frac{1}{3}$	" " " " "
Vertical. " Astragal and fillet	$\frac{1}{6}$	$\frac{1}{6}$	—	$\frac{1}{6}$	Semi-diameter of Shaft.
Vertical. " Fillet below Astragal	$\frac{1}{3}$	$\frac{1}{3}$	—	$\frac{1}{3}$	Height of Astragal and Fillet.
Horizontal. Projection of Base beyond Diameter	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	Semi-diameter of Shaft.
Horizontal. " Upper Torus	—	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	" "
Horizontal. Diminution of Shaft at Top	$\frac{1}{12}$	$\frac{1}{8}$	$\frac{1}{6}$	$\frac{1}{6}$	" "
Horizontal. Projection of Cap over Shaft at Top	$\frac{1}{2}$	$\frac{1}{2}$	—	—	Semi-diameter of Shaft at Top.
Horizontal. " Cap over Shaft at Base	—	—	$\frac{1}{2}$	$\frac{1}{2}$	Semi-diameter of Shaft.
Horizontal. " Bead at top of Shaft	$\frac{1}{6}$	$\frac{1}{6}$	—	$\frac{1}{6}$	" "
THE ENTABLATURE.					
Vertical. Height of Architrave	$\frac{2}{7}$	$\frac{2}{8}$	$\frac{3}{10}$	$\frac{3}{10}$	Height of Entablature.
Vertical. " Frieze	$\frac{2}{7}$	$\frac{3}{8}$	$\frac{3}{10}$	$\frac{3}{10}$	" "
Vertical. " Cornice	$\frac{3}{7}$	$\frac{3}{8}$	$\frac{3}{10}$	$\frac{3}{10}$	" "
Vertical. " Fillet and Cyma	$\frac{1}{3}$	$\frac{3}{8}$	Both fillets $\frac{1}{4}$	Both fillets $\frac{1}{3}$	" Cornice.
Vertical. " Corona and Fillet over	$\frac{1}{3}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{3}$	" "
Vertical. " Base of Corona to top of Ovolo	—	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{3}$	" "
Vertical. " Top of Ovolo to Frieze	$\frac{1}{3}$	$\frac{3}{7}$	$\frac{1}{4}$	$\frac{1}{3}$	" "
Horizontal. Total projection of Architrave over top diam. of Shaft	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{5}$	" Architrave.
Horizontal. " top face of Architrave " "	$\frac{1}{3}$	$\frac{2}{3}$ (guttae)	$\frac{1}{3}$	$\frac{1}{4}$	Total projection of Architrave.
Horizontal. " of Cornice over Frieze	1	$\frac{4}{3}$	1	1	Height of Cornice.
Horizontal. " Inset of Corona from top of Cornice	1	$\frac{5}{6}$	1	1	" Fillet and Cyma of Cornice.
Horizontal. " Length of Modillions (or Mutules)	—	$\frac{1}{2}$	$\frac{1}{2}$	(and ogee) $\frac{1}{3}$	Diameter of Column.
Horizontal. $\frac{1}{2}$ Breadth of Modillions (or Dentils)	—	(triglyph) $\frac{1}{2}$	M. $\frac{1}{6}$ D. $\frac{1}{12}$	$\frac{1}{6}$	" "
Horizontal. $\frac{1}{4}$ Space between Modillions (or Dentils)	—	(metope) $\frac{1}{1}$	M. $\frac{1}{3}$ D. $2\frac{1}{4}$	—	" "
THE PEDESTAL.					
Vertical. Height of Plinth	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	Height of Pedestal.
Vertical. " Base	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	" Plinth.
Vertical. " Cyma of Base	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{2}$	(and fillet) $\frac{1}{2}$	" Base.
Vertical. " Fillet below Cyma	1	1	1	1	Fillet above Cyma.
Vertical. " Cap	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	Height of Plinth.
Vertical. " Base of Corona to top of Cap	$\frac{2}{3}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	" Cap.
Horizontal. Projection of Cap and Plinth over Die	1	1	1	1	" Base of Pedestal.
Horizontal. " Corona of Cap over Die	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	Projection of Cap over Die.

Note.—The "Diameter" is always the greatest diameter of the drum of the Column. M. refers to the Modillion Cornice. D. to the alternative Dentil Cornice.

PLATE 2.



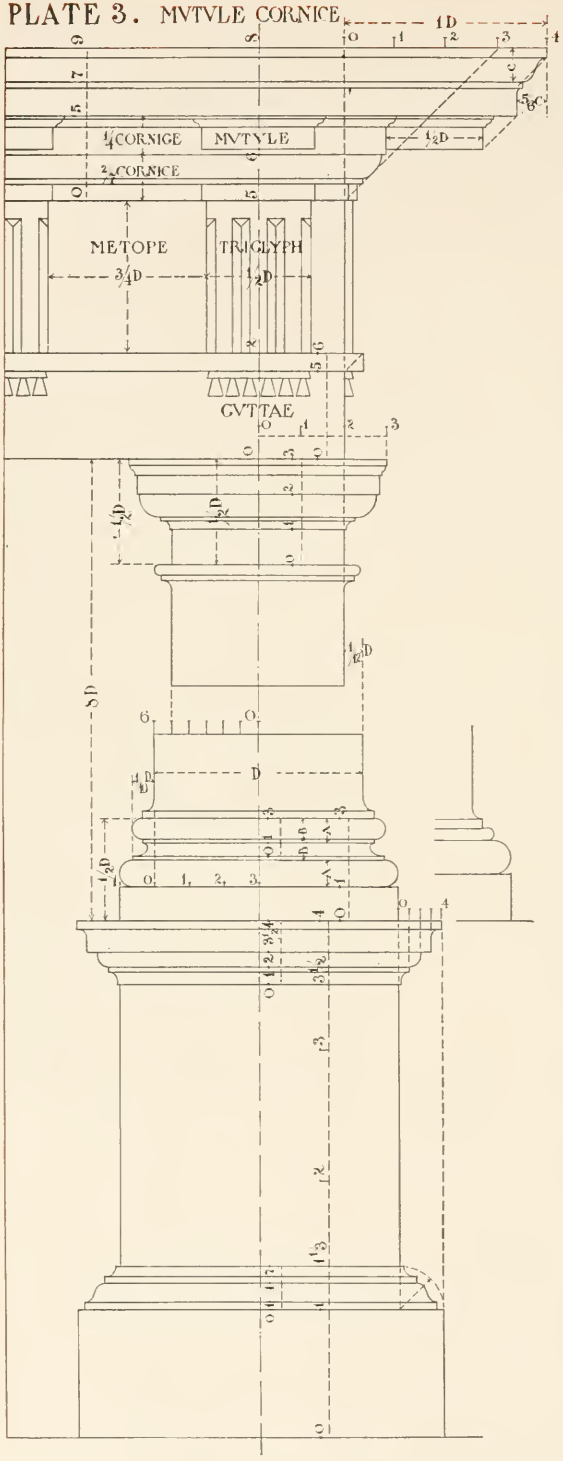
TVSCAN

Plate II.

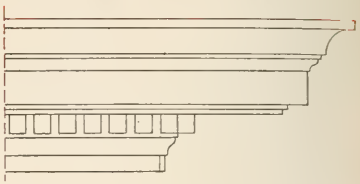
The Tuscan Order, though seldom used, is suitable for situations in which an appearance of strength and simplicity is required, and in which the cost of the work is an important factor. It should always be devoid of any enrichment and the unbroken character of the frieze and cornice makes it particularly useful in designs presenting awkward problems of intercolumniation.

The ratio of the dimensions of its parts is exceedingly simple. It should be noticed that the fillet below the cincture of the shaft is included in the height of the base of this Order. The projection of the cornice over the upper circumference of the column is, in this and in all Orders, except the Doric, equal to its height.

PLATE 3. MVTVLE CORNICE



DENTICVLAR CORNICE



DORIC

Plate III.

The Doric Order is always effective when used in lower storeys, arcades, and door and window openings, but owing to the triglyphs upon the frieze, which must fall centrally over the columns, it is the most difficult to deal with when spacing is in question.

The dimensions of the cornice do not lend themselves to any simple ratio and its projection is always greater than that adopted for the other Orders. The 45° line from the top of the frieze at once gives the bed mould of the mutule course, and one-third of the height of the cornice added to the top projection of this guiding line gives the total projection, while the mutules are one-half a diameter in side elevation. Some considerable modifications of the Order, as here represented, will be found to exist in many recognised examples. Occasionally the mutules are dispensed with, and their bed mould is cut to form a dentil course, as in the Theatre of Marcellus. The cyma crowning the cornice is often replaced by a cavetto, while the Doric base (shown alternatively on the plate) sometimes replaces the more graceful attic base. When this base is used, the upper fillet should be included in the height of the base, as in the Tuscan Order.

PLATE 4.

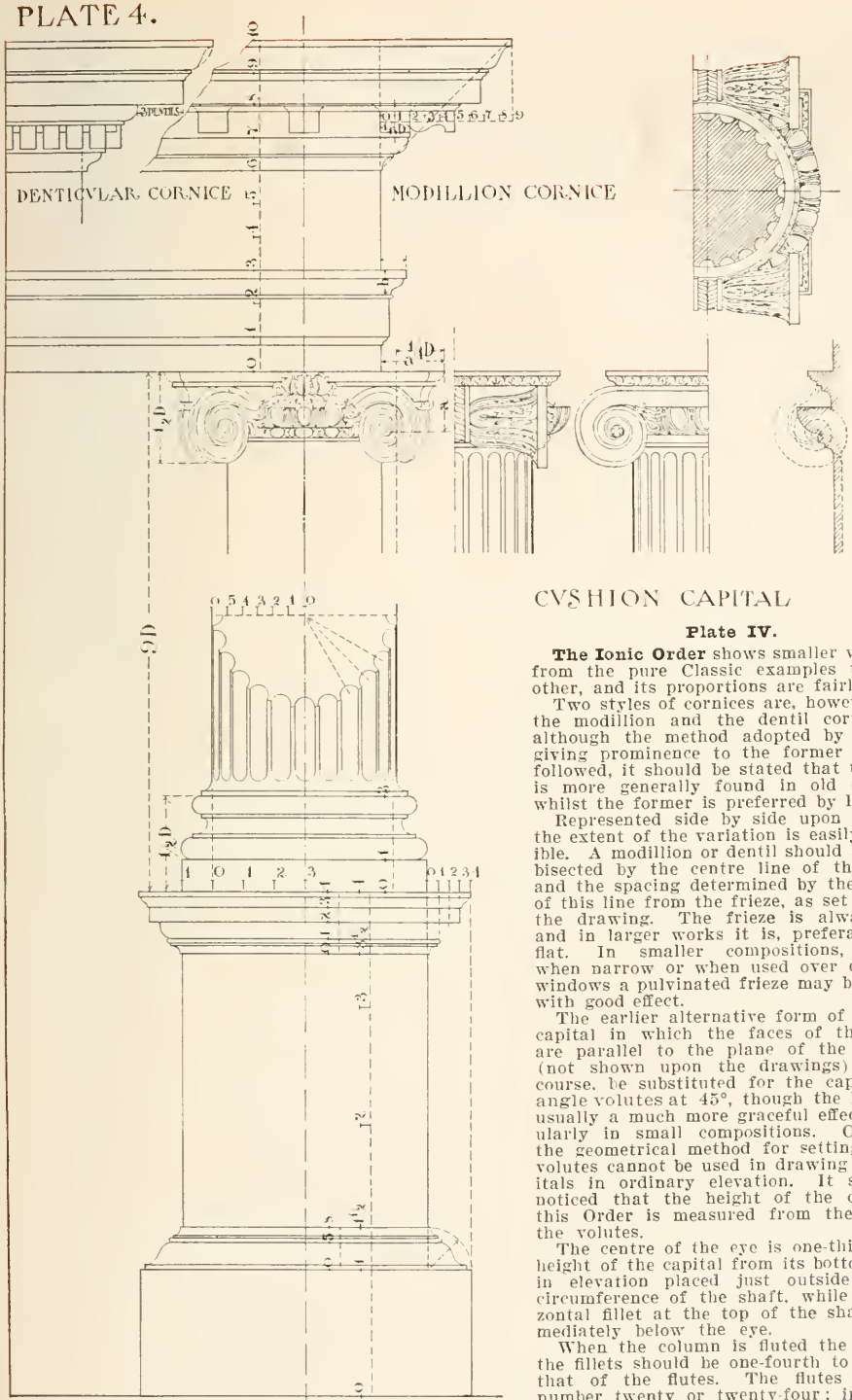


Plate IV.

The Ionic Order shows smaller variations from the pure Classic examples than any other, and its proportions are fairly simple.

Two styles of cornices are, however, used, the modillion and the dentil cornice, and although the method adopted by Gibbs of giving prominence to the former has been followed, it should be stated that the latter is more generally found in old examples, whilst the former is preferred by Palladio.

Represented side by side upon the plate the extent of the variation is easily discernible. A modillion or dentil should always be bisected by the centre line of the column and the spacing determined by the distance of this line from the frieze, as set out upon the drawing. The frieze is always plain and in larger works it is, preferably, kept flat. In smaller compositions, however, when narrow or when used over doors and windows a pulvinated frieze may be adopted with good effect.

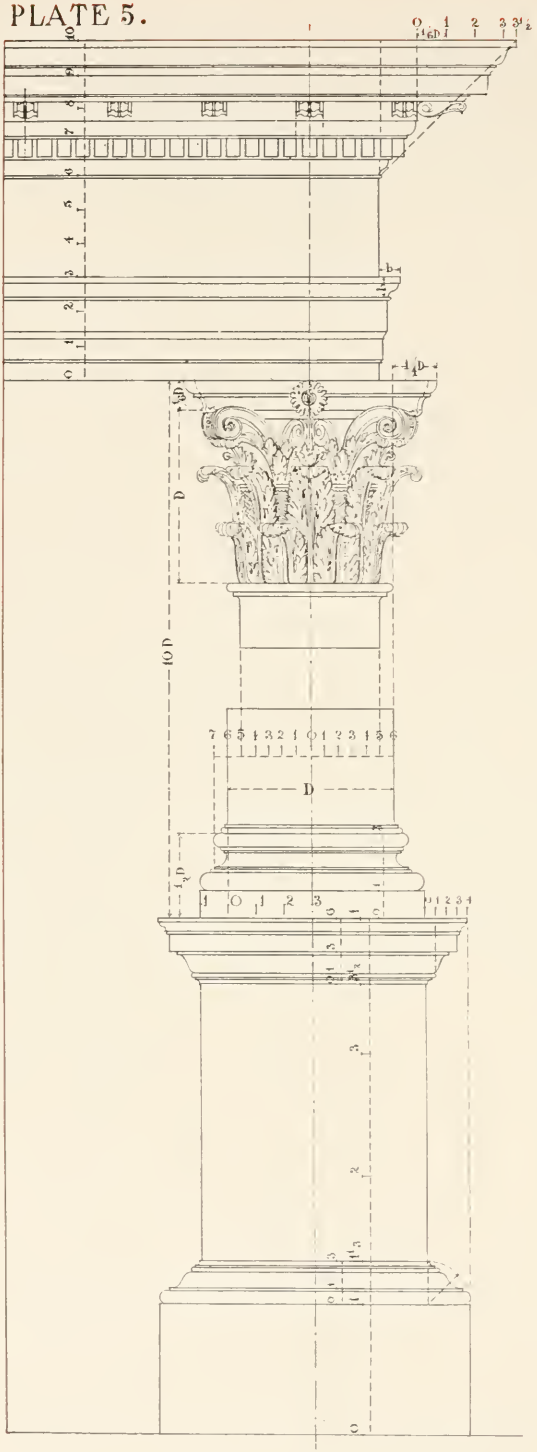
The earlier alternative form of the Ionic capital in which the faces of the volutes are parallel to the plane of the elevation (not shown upon the drawings) may, of course, be substituted for the capital with angle volutes at 45°, though the latter has usually a much more graceful effect, particularly in small compositions. Of course, the geometrical method for setting out the volutes cannot be used in drawing such capitals in ordinary elevation. It should be noticed that the height of the capital in this Order is measured from the soffit of the volutes.

The centre of the eye is one-third of the height of the capital from its bottom and is in elevation placed just outside the top circumference of the shaft, while the horizontal fillet at the top of the shaft is immediately below the eye.

When the column is fluted the width of the fillets should be one-fourth to one-third that of the flutes. The flutes generally number twenty or twenty-four; in the latter case the simple method of setting them out on plan, as shown on the drawing, will be found of service.

The attic base is always used with the Ionic Order.

PLATE 5.



CORINTHIAN

Plate V.

The Corinthian Order has been represented with considerable variations from the original type.

The Ionic entablature was often used by the ancients, supported by Corinthian columns, and the Corinthian cornice itself, though here represented with a dentil band, is often found without one. No general rule appears to exist for spacing the modillions or for their dimensions, the ratio of the width of the modillion to the space between two of them varying from 1 : 1½ to 1 : 2½, and again the number of the dentils between the modillions varies from 2 to 5 in different examples.

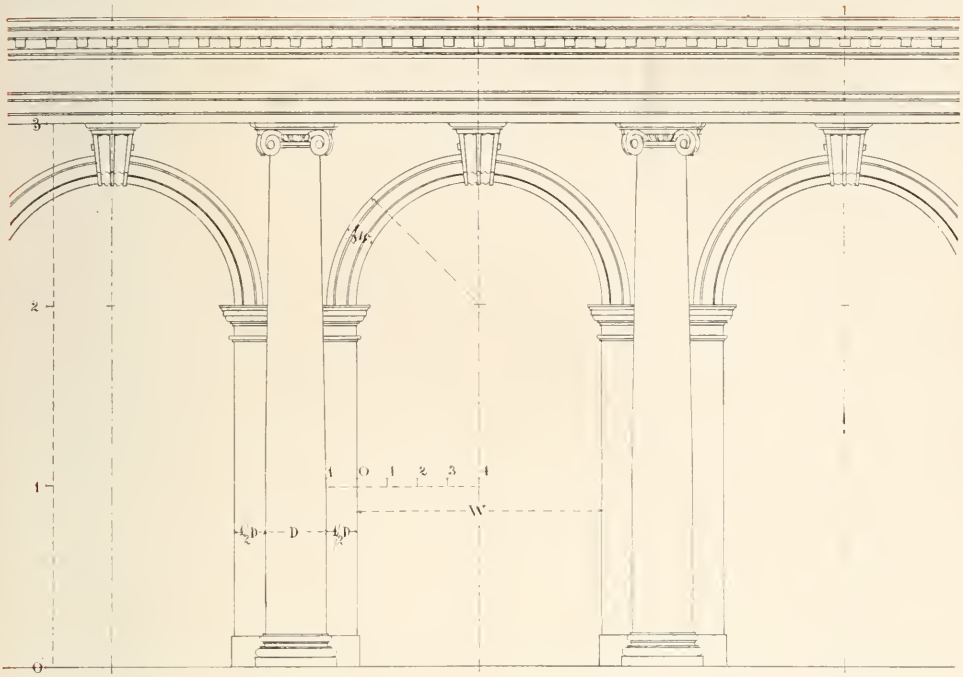
Both features should be symmetrically placed with reference to one another and to the centre line of the column, a point often neglected. To secure this result the following method is recommended :— Draw a modillion one-sixth of the diameter of the column in width, arranged symmetrically over the centre line of the column. Place another with its outside edge three and a half times its width within the total projection of the cornice and thus obtain the spacing between the blocks. Divide the distance between two modillion centres into 15 parts, give two to a dentil, to be placed symmetrically under a modillion, and one to each space between the dentils, which will be found to bring the inside edge of the last dentil before the return, on the frieze line.

The form and projection of the leaves of the capital are largely matters of individual taste, but the general method of their arrangement will be evident after examining the drawing. It may, however, be noted that the eye of the volute is just outside the lower circumference of the shaft, and that the tiers of leaves divide the capital below the abacus into three approximate equal horizontal sections.

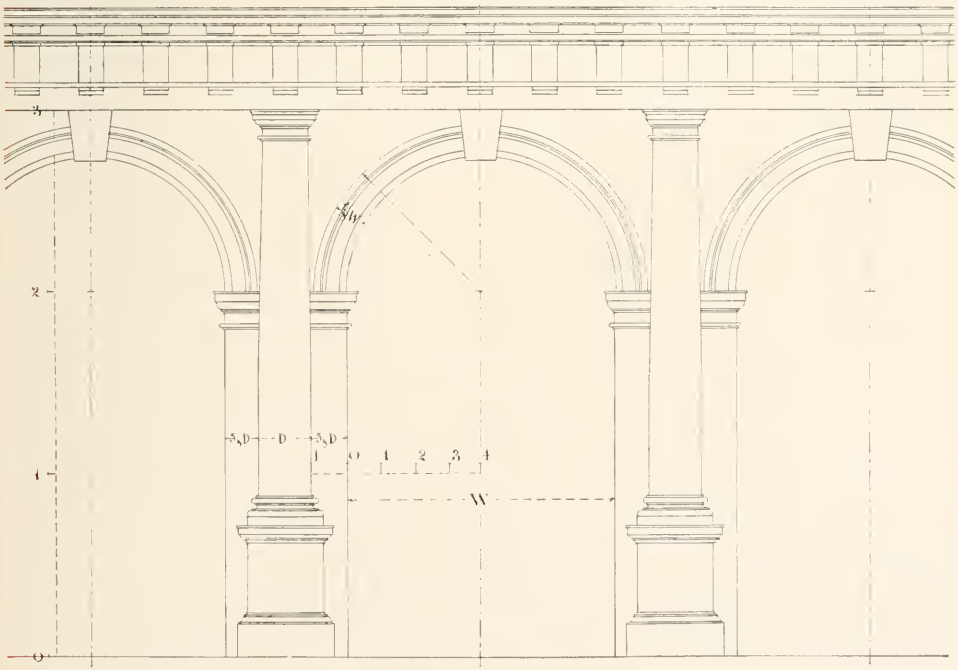
The column may or may not be fluted as in the Ionic Order.

The attic base, as used in the Ionic Order, is very generally employed—in fact, it is often preferable to adopt it, omitting the additional mouldings shown, for the sake of variety, on the drawing.

PLATE 6.



IONIC



DORIC

Plate VI.

The relations and dimensions given in this and similar subsequent plates must, therefore, be looked upon as necessarily somewhat elastic. At the same time, such dimensions as are given should not be disregarded, but considered in the light of proportions to be attained as far as the exigencies of the plan will admit.

The spacing of arcading dealt with in this plate should be governed by the height of the space to be treated, and it will be found that the best effects are obtained when the widths of the openings approximate to half of their height, and when the total width of the piers lies between one-half and two-thirds of that of the opening.

The spacing must also be considered in reference to the Order employed, so that when triglyphs, or modillions, are placed centrally over the columns their proper spacing may be interfered with as little as possible. It will thus be seen that a relation exists between the diameter of the column, the width of the pilaster, and the width of the opening. Again, the diameter of the column relatively to the opening will be influenced by the presence, or absence, of a pedestal to the Order. The summary shown, collected from Gibbs's work, giving the dimensions to be aimed at in order to comply with the above relations, will be found useful:

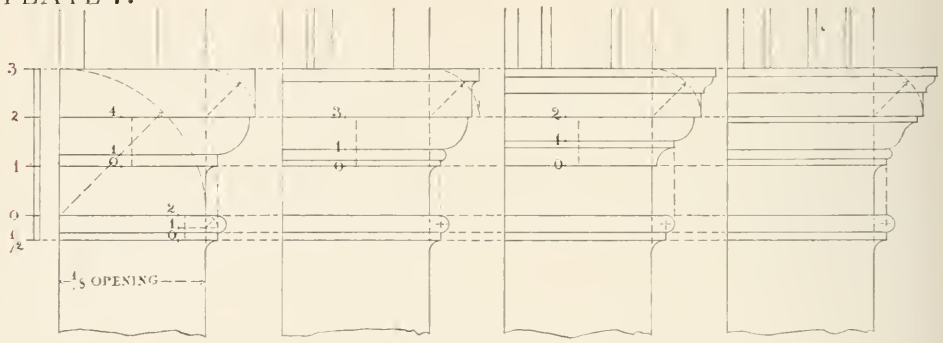
The height of the impost should always be about two-thirds of the height from the ground to the soffit of the architrave of the Order, whether a pedestal is in use or not.

Diameter of Column = 1.

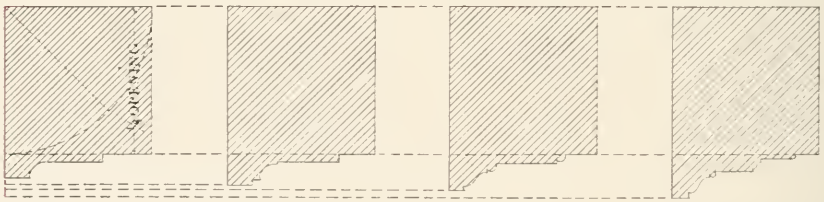
	Tuscan.		Doric.		Ionic.		Corinthian.	
	No Ped.	With Ped.	No Ped.	With Ped.	No Ped.	With Ped.	No Ped.	With Ped.
Width of bay centre to center	6	7	6¼	7½	6	7½	6 5-12	8⅛
Width of one pilaster	½	⅔	½	⅝	½	⅝	⅜	7-10
Width of opening	4	4⅔	4¼	5¼	4	5¼	4⅓	5⅗

The archivolt or moulding running round the arch should be the same width as the pilaster (less any necessary clearance for the mouldings) —that is, about one-eighth of the width of the opening, which should also be the height of the impost cap to the bottom of the necking. Further details as to the members will be found on Plate VII.

PLATE 7.



IMPOSTS AND ARCH MOVLDS



TVSCAN DORIC IONIC CORINTHIAN

Plate VII.
Impost Mouldings.

Details are here given of impost mouldings, with their archivolts, suitable for the different Orders. The divisions of the imposts are all simple and similar in each example, the height of the corona and of its mouldings above, if any, being equal to the height of the mouldings below, which, again, are equal to the necking. The bead and fillet below the necking are one sixth of the height of the impost, the bead being double the height of the fillet. The projection of the impost beyond the line of the pilaster is equal to the height of the corona and member over in the first two Orders, while the projection of the corona itself is equal to this height in the last two.

The pilaster is square on plan, and, therefore, the plan of the archivolt is represented by this square upon which the mouldings are placed. An examination of these mouldings will show that they resemble the architraves given for their respective Orders, and their forms admit of similar variations. It will be noticed that the innermost face is always in the plane of the face of the pilaster, while the projection of the moulding at the extrados increases from about one-quarter the width of the whole archivolt in the Tuscan to one-third in the Corinthian Order.

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SUBJECT INDEX.

System of Classification for Filing Data, Drawings, Plates, Catalogues, Etc., in Architects' and Contractors' Offices.

INTRODUCTION.

The decimal system of classification was devised and elaborated by Mr. Melvil Dewey, formerly director of the New York State Library. This system was intended primarily for the use of librarians in the classification and arrangement of books and pamphlets, but it was soon found that the system furnished also a simple and effective means of classifying, indexing and filing literary matter of all kinds. Engineers have found it useful for indexing technical data and information, catalogs, reports, card systems, drawings, etc., and it has been found equally useful by manufacturing and business concerns.

Much of the following information is taken from the University of Illinois Engineering Experiment Station, Bulletin No. 9, prepared by L. P. Breckenridge, Professor of Mechanical Engineering, and G. A. Goodenough, Associate Professor of Mechanical Engineering, and Bulletin No. 13 by N. Clifford Ricker, D. Arch. Professor of Architecture.

EXPLANATION OF THE DECIMAL SYSTEM.

The essential characteristic of the Dewey System is its method of division and subdivision. The entire field of knowledge is divided into nine chief classes numbered by the digits from 1 to 9. Matter of too general a nature to be included in any of these classes is put into a tenth class and indicated by 0. The following are the primary classes of the Dewey System:

0 GENERAL WORKS
1 PHILOSOPHY
2 RELIGION
3 SOCIOLOGY
4 PHILOLOGY
5 NATURAL SCIENCE
6 USEFUL ARTS
7 FINE ARTS
8 LITERATURE
9 HISTORY

Each of these classes is again divided into nine divisions, with a tenth division for general matter, and each division is separated into nine sections. The sections are again sub-divided and the process may be carried as far as desired.

It is thought that this system will be especially valuable to architects for classifying drawings, catalogs, reports and technical data. Our space is too limited to publish the complete work, nor is it desirable. Should any one be sufficiently interested to go into the matter thoroughly, they should have Mr. Dewey's complete text on the subject. In order to make the application of the system clear in the briefest possible way, the miscellaneous information contained in this book has been assumed to comprise a small architect's library and has been classified according to the Dewey System. It is hoped that this will make clear the practical application to architects' libraries, both large and small. In succeeding years, we hope to be able to publish a more extensive relative index in which the items of the classification are arranged alphabetically, the one at present published only covering the items of miscellaneous information contained in this book, with some of the more important general topics. We are particularly concerned as practitioners of the profession of architecture with divisions 6 and 7, "Useful Arts" and "Fine Arts," comprising the following subject numbers:

600 USEFUL ARTS
610 MEDICINE
620 ENGINEERING
630 AGRICULTURE
640 DOMESTIC ECONOMY
650 COMMUNICATION AND COMMERCE.
660 CHEMICAL TECHNOLOGY
670 MANUFACTURES
680 MECHANIC TRADES
690 BUILDING

Omitting all sub-divisions of this topic, with the exception of **690 "Building,"** we publish the sub-divisions of same. As distinguished from **"Architectural Construction," "Building"** has to do more particularly with the processes of construction and matters pertaining to trades and materials involved in the construction of buildings should be more properly classified under "Building", while matters as to types and component architectural parts are more properly classified under **Architectural Construction.**

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.95 **1, Bells; 2, Speaking Tubes; 3, Telephones; 4, Batteries; 5, Letter Boxes.**
.96 **1, Burglar Alarms; 2, Door Openers; 3, Lightning Rods; 4, Other Branches.**
.97 **Fixtures** (See 729.99).
.98 **Power Machinery.**
.99 **Laws. Company Restrictions, etc.**

697 HEATING AND VENTILATION. (Steam and Water Fitting.)
.1 **FIRE PLACES.** Dampers and Ash Drops.
.2 **STOVES.**
.3 **FURNACES.**
.4 **HOT WATER AND STEAM.**
.41 **Hot Water; 1, Low Pressure; 2, High.**
.42 **Steam; 1, Low Pressure; 2, High; 3, Vacuum.**
.43 **Boilers; 1, Steel Water Tube; 2, Steel Flue Tube; 3, Cast-iron Sectional.**
.44 **1, Valves; 2, Pipes; 3, Regulators; 4, Trimmings for Boilers; 5, Thermometers.**
.45 **Radiation, arranged alphabetically.**
.46 **Pipe Covering.**
.5 **ELECTRIC AND OTHER METHODS.**
.6 **LAUNDRY MACHINERY. CLOTHES DRYERS.**
.7 **FUELS. Fuel Handling Machinery.**
.8 **SMOKE FLUES. SMOKE PREVENTION.**
.9 **VENTILATION.** 1, Air Ducts; 2, Conduits; 3, Registers; 4, Fans.

698 PROTECTIVE, PRESERVATIVE AND DECORATIVE COVERING. (Painting, Wall-Hanging, Glazing, Floor Covering).
.1 Painting; .11, Oil; .12, Cold-water; .13, Stains Ext.; .14, Enamel Ext.
.2 **Distemper and Fresco.**
.3 **1, Varnishing; 2, Polishing Wax; 3, Staining; 4, Enamel.**
.4 **Other Modes of Protection.**
.5 **Glazing.** See 748, Stained Glass. .1, Stained Glass; .2, Plate Glass; .3, Ornamental Glass; .4, Prisms; .5, Mirrors.
.6 **Paper-hanging.**
.7 **Textile Hangings. Tapestry.**
.8 **Relief Work. Lincrusta. Stamped Leather, etc.**
.9 **Other branches. Carpets, Curtains and Rugs.**

699 **CAR AND SHIP BUILDING.**

/00 FINE ARTS.

701 **PHILOSOPHY. THEORIES. UTILITY. AESTHETICS.**

702 **COMPENDS. OUTLINES.**
703 **DICTIONARIES. CYCLOPEDIAS.**
704 **ESSAYS. LECTURES. ADDRESSES.**
705 **PERIODICALS. MAGAZINES. REVIEWS.**
706 **SOCIETIES. TRANSACTIONS. REPORTS, ETC.**
707 **EDUCATION. STUDY AND TEACHING OF ART.**
708 **ART GALLERIES AND MUSEUMS.**
.1 **American. Corcoran, Metropolitan, Boston. .2 English. National, Hampton Court, Windsor. .3 German. Dresden, Munich, Berlin, Vienna. .4 French. Louvre, Luxembourg. .5 Italian. Vatican, Sistine, Pitti, Medici, Borbonico. .6 Spanish. Madrid, Seville. .7 Russian. St. Petersburg, Hermitage. .8 Scandinavian. Copenhagen. .9 Other Countries.**
709 **HISTORY OF ART IN GENERAL.** Divided like 930-999.

710 LANDSCAPE GARDENING.
711 **PUBLIC PARKS.**
712 **PRIVATE GROUNDS. LAWNS.**
713 **WALKS. DRIVES.**
714 **WATER. FOUNTAINS. LAKES.**
715 **TREES. HEDGES. SHRUBS.** See also 634.9, Forestry; 582, Botany.
716 **PLANTS. FLOWERS.** .1, Plants; .2, Flowers; .3, Conservatories; .4, Window gardens; .5, Ferneries.
717 **ARBORS. SEATS. OUTLOOKS.**
718 **MONUMENTS. MAUSOLEUMS.**
719 **CEMETERIES.** See also 393.1, Earth burial; 614.61, Public health.

720 ARCHITECTURE.
.1 Theories, Esthetics, Architectonics; .2, Compends, Manuals; .3, Dictionaries, Cyclopedias; .4, Essays, Lectures; .5, Periodicals; .6, Societies; .7, Education, Study, Training, Schools of Architecture; .8, Polygraphy, Collections; .9, General History of Architecture, divided geografically like 940-999.
721 **ARCHITECTURAL CONSTRUCTION.**
.1 **Foundations.** See Bridge Engineering, 624.1, Foundations.
.2 **Walls, Partitions, etc.**
.3 **Piers. Columns.**
.4 **Arched Constructions.**
721.5 **Roofs.** See 695, Roof Coverings;
.6 **Floors and Flooring.** See 620.8.
.7 **Ceilings.**
.8 **DOORS. ENCLOSURES. WINDOWS.**
.81 **Doors, Wood.**
.82 **Doors, Metal.**
.821 Single; .822, Double; .823, Sliding; .824, Concealed; .825, Fire-proof; .826. Sheet Metal on Wood; .827, Wire-glazed; .828, Vault; .829.
.84 **Windows, External.**
.85 **Windows, Internal.**
.86 **Architectural Treatment of Doors and Windows.**
.87 **Shutters, Blinds, Screens, Grilles.**
.871 Shutters, Wood; .872, Shutters, Steel; .873, Blinds, Ordinary; .874, Blinds, Venetian; .875, Screens, Insect.
.876 **Grilles, Wood.**
.877 **Grilles, Ornamental, Metal** (See 694.92).
.8771 **Window and Door Guards.**
.8772 **Stair Railings.**
.8773 **Elevator Enclosures.**
.8774 **Office Enclosures.**
.88 **Fastenings, Locks** (See 694.24).
.89 **Other Fixtures.**
.9 **Iron and Composite Structures.** See 620.1 for Strength of Materials. Classify here only that which cannot be placed elsewhere, under 721, etc.

721

.91 Cast-Iron Structures; .92, Wrought-Iron Structures; .93, Steel Structures; .94, Composite Structures; .95, Steel and Wood; .96, Steel and Stone; .97, Steel and Ceramic; .971, Steel and Brick; .972, Steel and Tile; .973, Steel and Terra Cotta; .98, Steel and Glass; .99, Wood and Glass.

722, 723, 724 HISTORY OF ARCHITECTURE. Classify modern American buildings of importance in the History of Architecture under 724; generally all other American buildings under 725 to 728 inclusive.

Modern foreign buildings are usually placed under 724, unless of special importance as examples of the class or purpose, when they are to be treated like American buildings.

722. Ancient or Primitive Architecture.
.0 Prehistoric.
.02 England.
.04 France.
.07 Russia.
.08 Scandinavia.
722.11 China.
.12 Japan.
.13 Korea.
.14 Philippine.
722.2 Egypt.
.3 Phoenician, Jewish, etc.
.4 India, East.
.5 Western Asia.
.7 Roman.
.8 Grecian.
.9 Other Ancient Styles.
723. Mediaeval, Christian, Mohammedan.
.1 Early Christian.
.2 Byzantine.
723.3 Mohammedan.
.4 Romanesque.
723.5 Gothic.
724. Modern.
.1 Renaissance; .111, Scotland; .115, Ireland; .12, England; .121, Elizabethan; .122, Jacobean; .123, 17th Century; .124, 18th Century; .131, Germany; .136, Austria; .14, France; .141, Francis I; .142, Henry IV; .143, Louis XIV; .144, Louis XVI; .145, Empire; 724.15, Italy; .151, Cinquecento; .152, High Renaissance; .153, Decadence; .154, Rococo; .161, Spain; .169, Portugal; .17, Russia; .171, Canada; .172, Mexico; .173, United States; .1, Old Colonial; .2, Spanish Colonial; .178, South America; .1, Brazil; .2, Argentina; .3, Chili; .4, Bolivia; .5, Peru; .6, Ecuador; .7, Venezuela; .9, Paraguay; .18, Scandinavia; .181, Norway; .185, Sweden; .189, Denmark; .19, Minor Countries; .192, Holland; .193, Belgium; .194, Switzerland; .199.
.2 Classical Revival. Grecian.
.3 Gothic Revival.
.4 Tudor Gothic Revival.
.5 Queen Anne Revival.
724.6 Neo Grec.
.7 Half-Timber Swiss.
.8 Romanesque Revival.
.9 Other Recent Styles.
725 PUBLIC BUILDINGS.
.1 Administrative. Governmental.
.11 Capitols. Houses of Parliament.
.12 Ministries of War, State, etc.
.13 City and Town Halls. Bureaus. Public Offices.
.14 Custom Houses. Bonded Warehouses. Excise Offices.
.15 Court Houses. Record Offices.
.16 Post Offices, General and Special.
.17 Official Residences. Palaces of Rulers.
.18 Barracks. Armories. Police Stations.
.181 National Barracks.
.182 State Barracks.
.183 Armories. Barracks.

725

.184 National Police Buildings.
.185 State Police Buildings.
.186 City Police Buildings.
.19 Engine Houses. Fire Alarm Stations
.2 Business and Commercial.
.21 Stores, Wholesale and Retail.
.22 Mixed Store, Office, and Apartment Buildings.
.23 Office Buildings. Telegraph. Insurance.
.24 Banks. Safe Deposit. Savings.
.25 Exchanges. Boards of Trade.
.26 Markets.
.27 Cattle Markets. Stock Yards.
.28 Abattoirs.
.29 Other Business Buildings.
.3 Transportation and Storage.
.31 Railway Passenger Stations.
.311 Small (country) Stations.
.312 Large (city) Stations.
.313 Union Stations.
.314 Stations on two levels.
.315
.316
.317 Street-car Stations.
.318 Elevated R. R. Stations.
.319 Underground R. R. Stations.
.32 Railway Freight Houses.
.33 Railway Shops, Round Houses, Car Houses, Tanks, Stores.
.34 Dock Buildings. Wharf Boats and Houses.
.35 1, Warehouses; 2, Cold Storage; 3, Safe Deposit Storage.
.36 Elevators, Grain.
.37
.38
.39 Other.
.4 Manufactories.
.41 Textile Factories or Mills. Wool, Cotton, Silk.
.42 Breweries. Malteries. Distilleries.
.43 Foundries. Machine Shops. Iron and Steel Works.
.44 Wood-working Mills. Furniture Factories.
.45 Carriage and Car Factories.
.46 Paper Mills.
.47 Mills for Flour, Meal, Feed, etc.
.48 Pottery, Glass, Terra Cotta, Brick Works.
.49 Other Manufactories.
725.5 Hospitals and Asylums. See also 725.6. Reformatories.
.51 Sick and Wounded. Eye and Ear. Incurables. Lying-in.
.52 Insane.
.53 Idiotic. Feeble-minded.
.54 Blind. Deaf and Dumb.
.55 Paupers. Almshouses.
.56 Aged.
.57 Children. Orphans.
.58 Foundling.
.59 Soldiers' Homes.
.6 Prisons and Reformatories.
.61 State Prisons. Penitentiaries.
.62 Jails. Cell Houses.
.63 Reformatories for Adults. Houses of Correction.
.64 Reform Schools.
.65 Washingtonian Homes. Inebriate Asylums.
.7 Refreshment. Baths. Parks.
.71 Cafés. Restaurants.
.72 Saloons.
.73 Baths: Warm, Medicated, Turkish, Russian.
.74 Swimming Baths.
.75 Buildings for Watering Places, Spas, etc.
.76 Buildings for Parks and Streets. Public Comfort Stations.
.8 Recreation.
.81 Music Halls.
.811 Auditoriums.
.82 Theatres. Opera Houses.
.83 Halls for Lectures, Readings, etc.
.84 Bowling Alleys. Billiard Saloons.

725
.85 Gymnasiums. Turn Halls.
.86 Skating Rinks. Bicycle Rinks.
.87 Boat Houses.
.88 Riding Halls and Schools.
.89 Shooting Galleries.
.9 Other Public Buildings.
.91 Exhibition Halls.
.92 Temporary Halls. Tabernacles. Wigwams.
.93 Workingmen's Clubs and Institutes.
.94 Town Squares.

726 ECCLESIASTICAL AND RELIGIOUS.
.1 Temples.
.2 Mosques.
.3 Synagogues.
.4 Chapels. Sunday-school Buildings.
.5 Churches.
.51 Frame.
.52 Brick or Stone.
.521 Small Audt., seating less than 600.
.522 Large Audt., seating more than 600.
.6 Cathedrals.
.7 Monasteries. Convents. Abbeys.
.8 Mortuary. Cemetery Chapels. Receiving Vaults. Tombs.
.9 Other. Y. M. C. A., etc.

727 EDUCATIONAL AND SCIENTIFIC.
.1 Schools.
.11 Ward and Grammar.
.12 High Schools.
Study and Recitation Rooms. Not including dormitory or boarding.
.2 Academies. Seminaries. Boarding Schools.
.3 Colleges. Universities.
.4 Professional and Technical Schools. Law, Theology, etc.
.5 Laboratories: Physical, Chemical. See 542.1, **Biological, etc. Zoological and Botanic Gardens.** See also 590.7 and 580.7.
.6 .1, Museums. .2, Herbariums. See 580.7.
.7 .1, Art Galleries. .2, Studios.
.8 Libraries. See 022, Library Buildings.
.9 Other. Learned Societies, etc.

728 RESIDENCES.
.1 Tenement Houses.
.11 City Homes of Poor.
.12 Country Homes of Poor.
.13 Cités Ouvrieres.
.2 Collective Dwellings.
.21 Flats; one family to the floor.
.211 Small Flats less than 8 rooms.
.212 Large Flats, 8 rooms or more.
.22 Apartment Houses; more than one family to floor.
.221 Five Suites or Less.
.222 Six Suites or More.
.2221 Elevator Service.
.2222 No Elevator Service.
.3 City Houses. Mansions. Palaces.
.31 Between party-walls. Stone.
.32 Between party-walls. Brick.
.33 Between party-walls. Partly wood.
.34 Semi-detached, including end houses in city blocks. Stone.
.35 Semi-detached, including end houses in city blocks. Brick.
.36 Semi-detached, including end houses in city blocks. Partly wood.
.37 Detached. Stone.
.38 Detached. Brick.
.39 Detached. Partly wood.
.4 Club Houses. Buildings for Secret Societies.
.5 Hotels.
.51 City Hotels.
.52 Summer Resorts.
.53 Country Inns.
.6 Village and Country Homes.
.61 Village Dwellings. On small lots.
.62 Stone.
.63 Brick.
.64 Concrete or stucco.
.65 Part masonry, part wood.

728.66 All wood. 1, less than 7 rooms; 2, 7-12 rm; 3, 13 rm or over.
.67 Farm Houses.
.68 Laborers' Cottages. 1, Frame; 2, Masonry.
.7 Seaside and Mountain Cottages. Chalets.
.8 Country Seats.
.81 Castles.
.82 Chateux.
.83 Manor Houses.
.84 Villas
.85 Log Houses.
.86 Bungalows.
728.9 Out-Buildings.
.91 Porters' Lodges.
.92 Servants' Quarters.
.93 Kitchens and Laundries.
.94 .1, Stables. .2, Carriage Houses. .3, Garages.
.95 Barns, Granaries.
.96 Dairies.
.97 Ice Houses.
.98 Conservatories. Green Houses. Graperies.
.99 Other.

729 ARCHITECTURAL DESIGN AND DECORATION.
.1 The Elevation.
.11 Composition; .12, Distribution; .13, Proportion; .14, Light and Shade; .15, Perspective effect; .15, .16, .17, .18, .19.
For projection of shadows and graphics of light and shadow see 515.63 and 515.7.
.2 The Plan.
.21 Elements required; .22, Distribution; .23, Proportion; .24, .25, .26, .27, .28, .29.
.3 Elementary Forms. For construction of these forms see 721.
.31 Walls. Mouldings. Cornices. .32, Piers, Columns. Pilasters, Pedestals and the Orders. Colonnades. .33, Arches and Arcades. .34, Vaults and Domes. .35, Roof. Spires. Dormers. .36, Towers. .37, Gables and Pediments. .38, Doors and Windows. Bays. Oriels. .39, Stairs and Balustrades. See also 515.83, Stereotomy; 604.8, Building.
.4 Painted Decoration.
729.5 Decoration in Relief.
.6 Incrustation and Veneering.
.7 Mosaic and Marble.
.71 Mosaic Ceilings; .72, Mosaic Walls; .73, Mosaic Floors; .74, Other Mosaic designs; .75, .76, .77, .78, .79.
.8 Stained Glass Design. For technical processes see 666.1; for history see 748.
.9 Architectural Accessories and Fixed Furniture.
.91 Altars, Pulpits, Tribunes, Dais Thrones (Ecclesiastical).
729.92 Seating for Public Buildings.
.921 Benches; 2, Settees; 3, Portable Chairs and Opera Chairs.
.93 Domestic Chairs, Tables, Couches, Stools, Beds, etc.
.94 Buffets.
.95 Mantels. Overmantels. Andirons.
.96 Steel Furniture.
.97 Window Shades.
.98 .1, Organs. .2, Pianos.
.99 Lighting Fixtures.

730 SCULPTURE.
731 MATERIALS AND METHODS.
732 ANCIENT.
733 GREEK AND ROMAN.
734 MEDIEVAL.
735 MODERN.
736 CARVING. SEALS. DIES. GEMS. CAMEOS.
737 NUMISMATICS. COINS. MEDALS.
738 POTTERY. PORCELAIN.
739 BRONZES. BRASSES. BRIC-A-BRAC.

INDEX TO BUILDING ORDINANCE.

(See Pages 65 to 188.)

NOTE:—In this index, matters relating to Officers, Appointments, Etc., come first, then the Classes from I to VIII, and lastly the General Provisions, each alphabetically arranged under their respective headings.

Officers, Inspectors, Appointments, Powers, Duties, Permits, Etc.

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U. S. Fidelity & Guaranty Co., 206 La Salle St. 90

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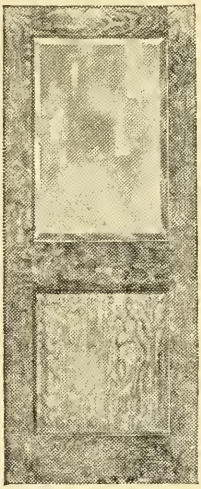
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